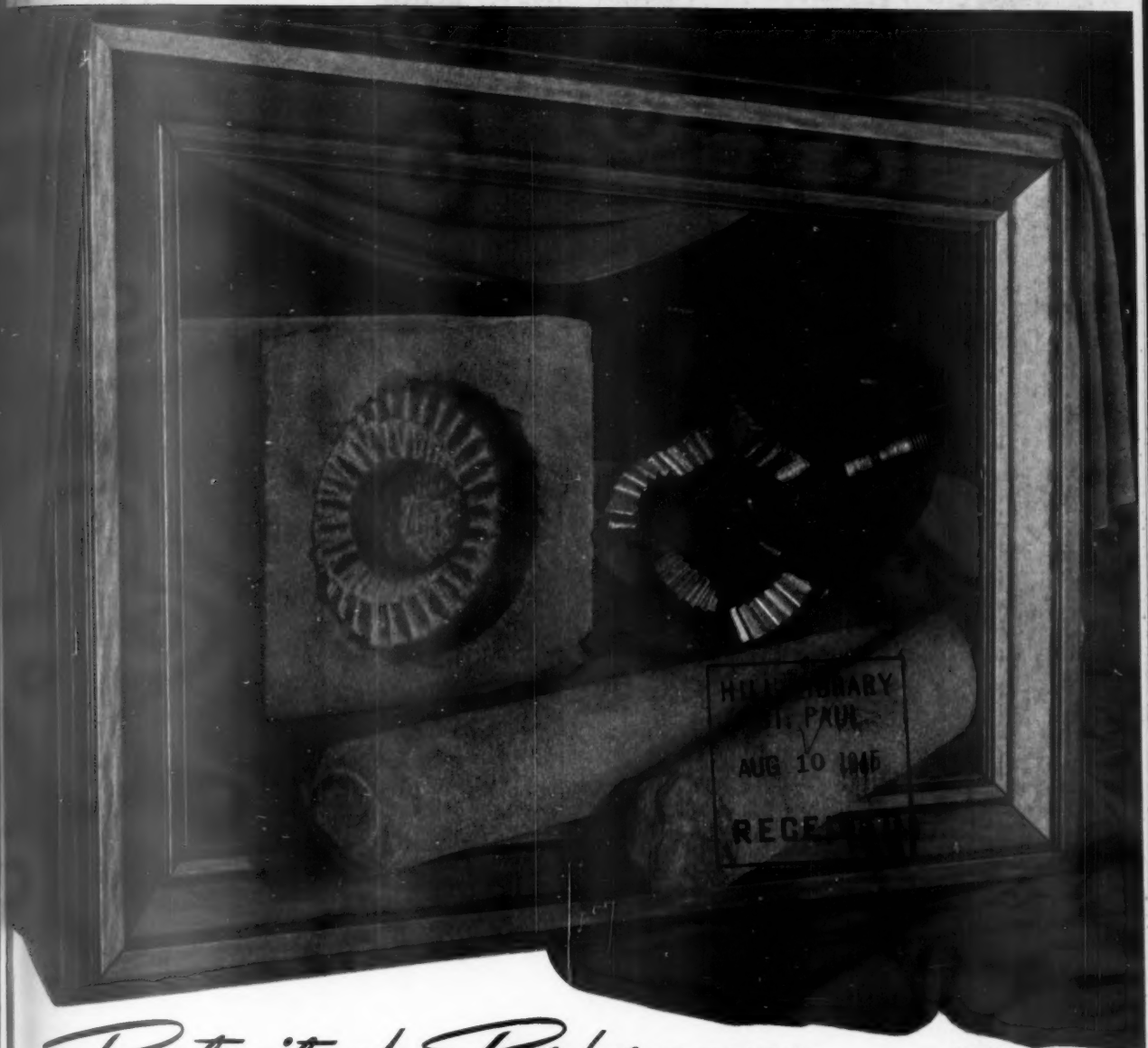
the OIL AND GAS JOURNAL



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HERE'S PROOF

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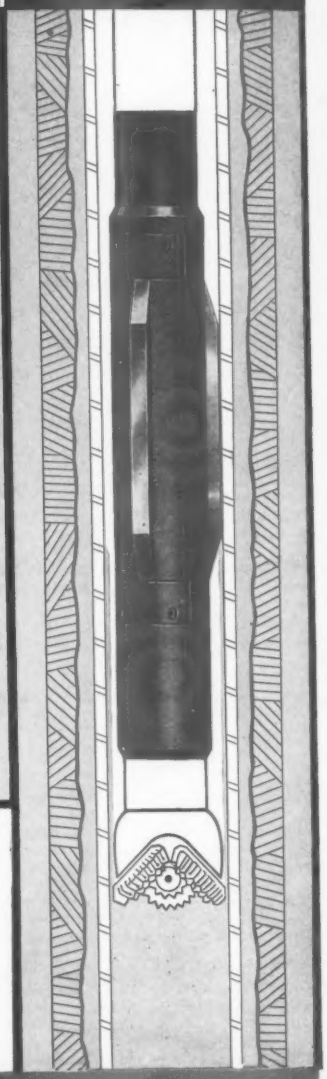
This casing is from a well that never was properly completed.

See how it could have been done with a *BAKER* Casing Scraper



If you have ever been "all burned up" because a packer or swab would not pack off—or a cement retainer set prematurely and could not be lowered past a certain point in the casing or liner—you probably were confronted with the condition pictured at the right.

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BAKER Rotary Casing Scraper

the OIL AND GAS JOURNAL

Trends

Crude-Oil Production
By States—Page 140

CRUDE-OIL STOCKS 218,507,000 bbl. as of July 28—down 399,000 bbl. One year ago 225,112,000 bbl.

GASOLINE STOCKS 86,008,000 bbl. as of July 28—up 78,000 bbl. One year ago 81,296,000 bbl.

RESIDUAL FUEL-OIL STOCKS 42,283,000 bbl. as of July 28—down 197,000 bbl. One year ago 56,667,000 bbl.

GAS OIL AND DISTILLATE STOCKS 36,071,000 bbl. as of July 28—up 613,000 bbl. One year ago 37,805,000 bbl.

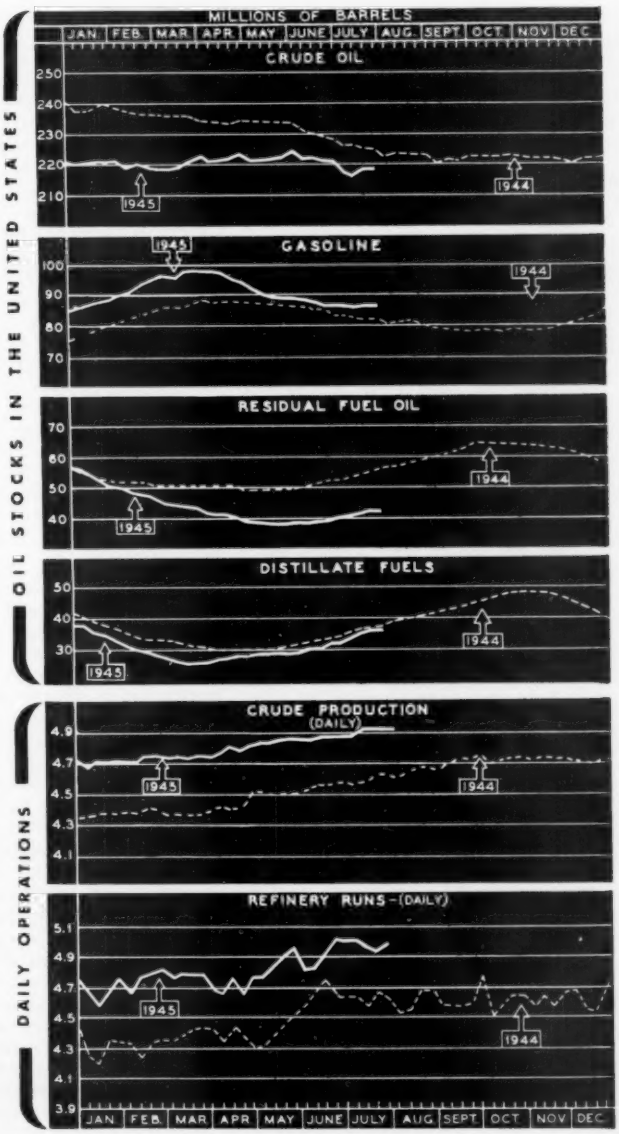
CRUDE-OIL PRODUCTION 4,919,600 bbl. as of August 4—down 8,600 bbl. One year ago 4,617,450 bbl.

REFINERY RUNS 4,996,000 bbl. daily week ended July 28—up 69,000 bbl. One year ago 4,629,000 bbl.

DISCLOSURE this week that release of atomic energy is an accomplished fact inspires the imagination of every petroleum chemist in the world. Forces available for dividing and rearranging the complex molecules have always been one of the limiting factors in the arts of refining and synthesis of petroleum products. Obviously, much work and research remain to be done before such a powerful force as atomic energy can be applied to industrial work and controlled within limits of available equipment. It is conceivable, however, that this new energizing force may be applied to accomplish in a matter of seconds some of the more tedious reactions in petroleum refining which now require hours.

ALSO brought within range of possibility are entirely new processes which have been impossible in the past because of the limitations of heat and pressure derived from previous available sources. Potentialities of atomic force are so far beyond the scope of imagination that any orderly appraisal of its application to the petroleum industry must await months or years of study. There is every reason to believe, however, that refiners will make full use of this new force to produce more and higher quality fuels. Products heretofore unknown or unrecoverable from the exceedingly complex molecules of heavy residual oils may be brought within reach of refiners by controlled release of atomic force.

WHEN converted to peacetime uses, atomic energy, which was a closely guarded war secret until directed against Japan, scores of applications will be found in the petroleum industry. The most obvious and probable utilization of this energizing force which staggers the imagination is in refining. Imagine though, for example, what might develop in the art of well shooting where the objective is to fracture the subsurface formation. With such highly concentrated energy it would be possible to concentrate almost any desired force at the face of the pay zone regardless of how thin the sand lense. Other possible applications are almost limitless, according to well qualified engineers, who were unwilling this week to go beyond some of the more obvious speculation until more information becomes available.



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Plans Made for Dissemination Of Nazi Oil Processes

by Henry D. Ralph

WASHINGTON. — Petroleum secrets which once served the Luftwaffe and Wehrmacht may be turned against the Japanese through a plan for disseminating captured German technical documents to American producers and refiners announced this week by Deputy Petroleum Administrator Ralph K. Davies.

The task of unscrambling, analyzing and summarizing technical data seized by the Government's technical mission in Germany will be handled by the Technical Advisory Committee of the Petroleum Industry War Council. For the time being, the captured records are classified as restricted material, and will be made available only to firms designated by PAW as being able to use the information in furthering the war against Japan.

Present restrictions, however, are expected to be relaxed in the near future, Davies said, pointing out that PAW hopes to make the material freely available to everyone interested subject only to restrictions imposed "by the military and other responsible government authorities." In addition to designated oil companies, TAC findings and recommendations will be made available to the U. S. Army service forces, Army Air Forces, Navy Department and the Bureau of Mines.

The plan of handling the information, explained by PIWC Chairman William R. Boyd, Jr., involves two steps to speed dissemination of material. Copies of the PAW index to all microfilms of documents received will be distributed as restricted material to eligible firms. From this English index, copies of specific microfilms may be ordered, on payment of a nominal processing charge. This will permit approved companies to translate and analyze the material themselves, or have it done by a research organization, without waiting for the TAC summary reports.

The second and slower step will provide a workable summary of precise processes taken from the technical mission's material for those who can employ it in the war effort.

TAC, a subcommittee of PIWC's technical committee, will organize the necessary number of teams, perhaps 15 or 20, of expert technologists to translate, abstract and analyze more than 100 microfilms 100 ft. long, each consisting of 1,000 35-mm. frames. "As soon as sufficient information is compiled on any subject, all information on it will be correlated in a composite report," Boyd said. TAC will set up groups of experts to do the correlating, using as many men as possible from those who were members of the mission to Germany. This system will get the information, by a necessarily slower route, to eligible firms in English.

The ultimate value of the technological data has not been fully assessed, but it is expected to have considerable value both for war purposes and peacetime use. Starting last February, American petroleum technologists followed the vanguard of American armies through Germany, seizing records and questioning German scientists. Of prime interest were German manufacturing methods by hydrogenation, catalytic cracking, hydroforming, alkylation, polymerization and other synthetic processes.

In studying the German material, American technologists will operate on the theory that somewhere in the Nazi secrets will be found ways of combining German scientific skill with American know-how, Boyd said, "not only to speed up the end of the war but to produce larger quantities and better qualities for civilian petroleum requirements."

Immediate Use Contemplated

A preliminary survey of the material, Davies explained, indicates the Germans had not developed anything revolutionary in fuels or petroleum products that can be put to immediate use. However, their laboratory techniques had been developed to a high degree and have revealed improvements which will increase accuracy and save time in refining operations. Over a longer period of time, the captured documents may play an important part in conserving oil resources.

Davies cited the following as examples of German developments:

A better method of olefin determination which will save several hours in processes used daily in almost every refinery in the country.

A method of quantitative nitrogen analysis, used by the Germans since 1938, which in certain phases of refining operation is superior to ours. The document outlining this process was marked "secret" and is thought not to have been published in German technical magazines.

Questioning of Dr. Paul Schmidt, credited by the Nazis as the inventor of the motor for the V-1 bomb, revealed that he was working on a new motor, capable of operating on unusually low grade fuels.

Members of the technical mission which gathered the information on German operations in liquid fuels and lubricants, the agencies under whose auspices the men were sent and the organizations which they represented, are:

Dispatched by Department of Interior, Bureau of Mines: Lester L. Hirst, chemist; Louis L. Newman, gas engineer; William W. O'Dell, chemical engineer; Wilburn C. Schroeder, acting chief, Office of Synthetic Liquid Fuels, and Guenther Von Elbe, physical chemist; Koppers Co., Alfred R. Powell, assistant director of research.

Dispatched by Petroleum Administration for War—Gulf Oil Corp.: Ernest Cotton, chemical engineer; Paul K. Kuhne, assistant to general manager; Gulf Research and Development Co.: William A. Horne, assistant head of petroleum processes section; Houdry Processing Co.: Warren F. Faragher; Humble Oil and Refining Co.: George S. Bays; Ernst F. Voss, chief engineer, refining; Koppers Co.: Irvin H. Jones, chemist; M. W. Kellogg Co.: Horace M. Weir, chemical engineer; PAW: Donald S. Fraser, chief, technical section, foreign refining division; Phillips Petroleum Co.: John G. Allen, process engineer; Jean P. Jones, chemist and attorney; Pure Oil Co.: Byron L. Mackusick, gas engineer; Hans Schindler, Sr., research chemist; Socony Vacuum Oil Co., Inc.: L. P. Evans, chemical engineer; Standard Oil Co. of New Jersey (Louisiana Division): Leonard E. Carlsmith, chemical engineer; Standard Oil Development Co.: E. L. Baldeschweiler, chemist; The Texas Co.: Harold V. Atwell, research supervisor; Universal Oil Products Co.: Vladimar Haensel, research chemist

Neches Butadiene Plant Operates at Capacity

PORT NECHES, Tex.—Production of 52,000 tons of butadiene from petroleum in the first 6 months of this year was announced last week by Neches Butane Products Co., which is jointly operated by five oil companies for the Government's synthetic-rubber program. This is the rated capacity of the plant. If this production is applied to the manufacture of synthetic-rubber tires for civilian passenger automobiles, it is estimated that 12,500,000 new tires will be available to the public.

Tanker Deliveries to East Coast Increased to 652,700 Bbl. Daily

WASHINGTON. — Tankers delivered 4,569,000 bbl. of crude oil and petroleum products to East Coast ports last week, an increase of 1,519,000 bbl. over the previous week, it was disclosed by the Petroleum Administration for War. Deliveries consisted of 2,171,000 bbl. originating at Gulf Coast ports and 2,398,000 bbl. from Latin American producing and refining countries.

The use of tankers to supply the East Coast with petroleum products carries with it the possibility of overtaxing diminished ocean-terminal storage facilities unless stocks are drawn down by filling up the fuel tanks of householders during the summer months.

"It is to the advantage of East Coast consumers," said Ralph K. Davies, deputy petroleum administrator, "that PAW utilize this temporary tanker transportation to the maximum extent possible, since with increased activities in the Pacific this transportation may not be available to us when needed next winter."

"This does not mean that the overall stocks of kerosene and fuel oil are available in great volume. On the contrary, stocks are extremely tight and at best we can hope only to supply the same volume to civilians as we supplied last winter. We do, however, want to take advantage of the temporary opportunity to move the short supply of fuel-oil stocks to the point of consumption while transportation is available."

These petroleum supplies for civilian use, Davies explained, must be handled through ocean-terminal storage facilities just as they were in prewar days when tankers were the principal means of petroleum transportation to the East Coast. The facilities now available for civilian supplies are not so great, however, as they were in prewar days, he added, because this storage is now being used for military supplies.

As the switch-back to the use of tankers has progressed, ocean-terminal storage for civilian supplies has proved adequate so far only by reason of careful scheduling and planning of petroleum movements into the eastern states, Davies explained.

"However, stocks of kerosene and home-heating fuel oil will be built up as usual in advance of the heavy burning season during the remainder of the summer and through the fall," he said.

"If consumers of home-heating oil fill their tanks now, suppliers will be able to store more petroleum products, which, in turn, will draw down the stocks in terminal storage, thus making room for more cargoes."

Carriers Slated for Study By Senate Committee

WASHINGTON.—The Senate interstate commerce committee reported favorably on a proposal (S. Res. 161) calling for a complete study of interstate and foreign carriers including pipe lines, aircraft, railroads, inland waterways, buses, and trucks. Senate action is scheduled sometime after the recess.

The resolution calls for a study by the committee or a special subcommittee, covering the interrelation of the carriers named, postwar character and adequacy of services rendered by them, and developments and improvements which may be anticipated. Legislation aimed at a consistent public policy fair to competing carriers, the public, and labor is to be recommended by the committee making the study.

New Policy Proposed for Pricing Residue Gas

WASHINGTON. — A distinct departure from the present policy of pricing residue gas for use in carbon black will result from an Office of Price Administration agreement with natural-gas and carbon-black-industry representatives if the agreement is approved by the full industry advisory committees of the two industries involved.

Under the agreement, residue gas will be sold as such, and the selling price based upon the Btu. content of the gas as related to its recoverable value for carbon black use, Orville Judd, fuel director for OPA, said this week. Previously, the price has been based on the end product and the gas itself carried no set value.

OPA will submit to the industries a graph based on 970 Btu. minimum per 1,000 cu. ft., with a proportionate price increase per 1,000 cu. ft. as the gas value increases, based upon the probable yield for carbon black.

Upon approval of the plan, OPA will revise its price regulation to provide for certain increases for the carbon black industry. New prices should be in effect by September 1 if approval is given quickly, Judd said.

20 Acre Spacing Plan for Halstead Pool, in Kansas

CHICAGO. — Revoking the previous spacing pattern the Petroleum Administration for War, effective August 1, announced a new 20-acre rule for the Halstead pool in Harvey County, Kansas. The new pattern limits the total number of wells on a quarter-quarter section to two, and provides that one-half of a quarter-quarter section shall be a drilling unit. Wells must be at least 800 ft. apart, with two exceptions. Where a previously drilled well is within 100 ft. of the center of a 20-acre drilling unit, the second well may be only 725 ft. away. If a previously drilled well is in the approximate center of a quarter-quarter section, the second well may be located at a distance of 400 ft. therefrom.

Crude Price Increase for Abell Pool, Pecos County

Effective August 12, an increase of 13 cents per bbl. will be posted for Ordovician oil from the Abell pool, Pecos County, Texas, by the Sinclair Prairie Oil Co., marketing division. The new price schedule will start at 93 cents for crude below 25° gravity, with an increase of 2 cents for each degree of gravity, to a top of $1.25 for 40° and above.

Wartime Oil Facilities to Be Considered After Congress Reconvenes

WASHINGTON.—The O'Mahoney oil investigating committee will take up the subject of disposing of war surplus pipe lines and refineries when hearings are resumed after Congress reconvenes in October, it was learned this week.

Meanwhile, some committee hearings will be held during the recess, probably in Wyoming and Colorado, on the question of amending the general leasing act.

In the event that the war with Japan were to end before October, committee hearings would be held immediately to air the question of a government policy in disposing of surplus petroleum properties.

XUM

Consumers Again Urged to Arrange Fuel-Oil Supplies

WASHINGTON.—Warning that delays in laying in domestic fuel oil supplies may result in cold homes this coming winter, the Office of Defense Transportation urged home owners to attend to their fuel needs before the summer ends.

The reasons for this advice, it was explained, are that the nation's tank-truck fleet is not at present working to capacity and can make prompt deliveries; that there is sufficient manpower available, and that weather conditions are suitable. Later on, after the summer is over, there will be a heavy demand on tank trucks and it will not be possible to fill orders for domestic fuel oil.

"Summer is an excellent time to fill up your fuel oil tank," said Col. J. Monroe Johnson, ODT director. "Later, there will be a general rush to place orders, which will put too heavy a demand on both over-the-road tank trucks and local delivery trucks. Local delivery trucks will be emptying the storage tanks of fuel suppliers while over-the-road trucks will have a hard time refilling them. At present, fuel-oil suppliers have good stocks on hand and can fill orders without delay."

Colonel Johnson said that there are approximately 16,000 over-the-road tank trucks in operation at present and that the average age is 5 years as compared with 3 years before the war. The average age of the 110,000 local delivery trucks is about 8 years, as compared with a peacetime age of 3 years.

"Overloading such run-down equipment during a cold-weather rush of fuel deliveries would likely result in a breakdown of many trucks," Colonel Johnson warned.

Further Oil-Treaty Action Not Seen for August

WASHINGTON.—The next steps toward the proposed Anglo-American oil treaty will probably not be taken until sometime in September. Washington authorities assume that nothing can be done until the new British ministry goes into office August 15. The date for the British-American consultations will be set after that.

The question of Secretary of Interior Harold L. Ickes' part, if any, in the negotiations, remains unclarified. Unofficial Washington opinion leans to the viewpoint that his long-term lease on the secretaryship is close to expiration, the only question being "when."

Accuracy Sought in Jetting And Gas-Lift Operations

AUSTIN. — Railroad Commission of Texas will hold a hearing August 29 to determine whether it is possible for operators of jetting or gas-lift wells in Texas to make accurate checks and accurate reports on such wells to the commission, and for the commission to make accurate checks on such wells and to account for the gas now being used for jetting and gas-lift operations; also whether additional reports should be required from jetting and gas-lift operators to enable the commission to keep an accurate record of the gas used in such operations.

Cost Disparity in Ship-Sale Bill Stirs Disapproval

NEW YORK. — The disparity in cost between tankers and cargo boats (subsidized and unsubsidized) has stirred oil-industry criticism of the Bland ship-sale bill, which has been reported out of the House Merchant Marine committee.

Under provisions of the bill tankers can be purchased from the Government at 75 per cent of prewar domestic cost, but subsidized and unsubsidized cargo boats will cost only 55 and 50 per cent, respectively. Representative Bland's argument that tanker prices should be higher, because they are "operated for the most part by industrial firms for the carriage of their own products" is characterized as "superficial."

The industry is expected also to oppose that section of the bill which provides that the purchase price shall be based on prewar domestic cost rather than prewar foreign costs. It favors the latter basis because those prices would be lower, and the less a company has to pay for a ship the better able it will be to meet foreign competition, he asserted.

The industry is expected to be satisfied with the present trade-in values for tankers, both under the 90-day incentive period plan which sets up more liberal values, and with the old values outlined in the Merchant Marine Act of 1936, which take effect after the 90-day period.

Although there is opposition to chartering ships because this will put the Government into business in competition with private operators, it is not believed the Bland bill will be extended to allow for the chartering of other than dry cargo ships.

The American Merchant Marine Institute's tanker committee has been studying the bill, but has not yet outlined its stand for possible presentation at hearings when and if the measure reaches the Senate commerce committee next fall.

Navy Discounts Aid From Borneo Oil Fields

WASHINGTON.—The Navy this week threw cold water on over-optimistic hope for Borneo oil production in the near future. Capt. A. W. Rutter, supply corps, U.S.N.R., officer in charge of the fuel division, Bureau of Supply and Accounts, said that reopening the Borneo fields by no means solved petroleum production problems for the Pacific war.

First field to produce for the Allies will be Tarakan, but its production cannot exceed 4,800 bbl. a day by the end of this year, according to present estimates, or less than 1 per cent of total Pacific war requirements.

Within a year after its rehabilitation, the Seria field will add 10,000 to 12,000 bbl. daily. Balikpapan should contribute about 20,000 bbl. daily, but it is extremely unlikely that any of its oil will be available within the next 12 months.

When total Borneo oil production is available in about 12 to 18 months it will be limited to about 3 per cent of the military petroleum production requirements for Pacific operations. Meanwhile, Rutter said, best available figures indicate that the Allies still require, on a world-wide basis, more petroleum products than were needed while the war in Europe was in progress.

A.G.A to Hold Annual Meeting on October 24

NEW YORK.—The twenty-seventh annual meeting of American Gas Association will be held October 24, 1945, in the auditorium of the Engineering Societies Building, 29 West Thirty-ninth Street, New York. The Association will limit its yearly convention to a 1-day meeting.

Officers will be elected at the general membership meeting in the morning and committee chairmen will read reports covering the activities of their sections during the past fiscal year. The luncheon meeting and the remainder of the day will be devoted to organizational work by departments and committees.

THIS WEEK

TOPS—Crude production at highest point possible, says PAW. . . . Around 4,800,000 bbl. daily. . . . Greatest in history. . . . ¶Oil imports to East Coast from Latin America 343,000 bbl. daily. . . . New record. . . . Result of turning tankers from war service to domestic use. . . . ¶May demand for lubes sets all-time record. . . . Total, domestic and export, 4,163,000 bbl. . . . Up 15 per cent over May 1944. . . .

DISSENT—Mississippi drilling contractors protest tax assessments on rigs. . . . Minimum rates higher than maximum other oil states. . . . Valuation $45,000 compares with Arkansas $10,000, Illinois $7,500. . . . ¶President Knight, Oil Workers Union (C.I.O.), says removal of Davies from PAW would "do more to stimulate" output of oil products than anything else Government could do. . . . ¶Bland ship-sale bill stirs oil-industry opposition owing to cost disparity between tankers and cargo boats. . . . Tankers at 75 per cent of prewar domestic cost. . . . Cargo boats 50, 55 per cent. . . . ¶Controversy with OPA over crude prices increasingly heated. . . . Results of cost survey just being tabulated after months of discussion. . . . Refining survey still hanging fire. . . .

PROGRESS—Experimental dynamiting under oyster beds off Louisiana coast inflicts no damage on oysters. . . . Brightens prospects for under-water oil exploration. . . . ¶First engines for P-80 jet-propelled plane designed for kerosene, reducing altitude fuel problems, fire hazards. . . . With modification of fuel system can use gasoline, any octane. . . . Availability will determine which fuel to use. . . . ¶Fluorescein pumped into damaged pipe line under English Channel revealed location of breaks. . . . Large colored surface patches visible to aircraft, ships. . . . ¶Shoe soles treated with special oils give about 25 per cent more wear. . . . Estimated public saving $1,000,000 monthly. . . . Outgrowth Socony-Vacuum research. . . .

FOREIGN—Russia to get $160,000,000 worth of oil products from Romania as part of $340,000,000 reparations bill. . . . Allowed 6 years' time . . . ¶Royal Dutch plans for restoration of damaged properties in Netherlands East Indies well advanced. . . . Speed limited by supply of materials. . . . ¶Argentine already has received 200,000 bbl. fuel oil from United States under agreement to give it in exchange for linseed and other vegetable oils. . . . ¶Mexico says can't grant U. S. companies concessions to drill for oil. . . . Law requires such companies be composed wholly of Mexicans. . . . ¶Anglo-American pact delayed further by Labor party victory in England. . . . Means significant changes in British official group. . . .

EXPLORATORY—A. B. Turner and Col. W. C. O'Farrell receive $12,000 check from Arkansas for discovering new oil pool (Smart). . . . Bonus offered by legislature . . . ¶Although no important oil deposits found in Cuba, geophysical surveys and exploratory drilling continue active. . . . ¶Imperial Oil abandons deepest test drilled in western Canada. . . . Went 12,995 ft., cost $581,000. . . .

READJUSTMENT—Maritime Commission plans orderly disposal of war-damaged, over-age vessels, to avoid flooding scrap market after V-J Day. . . . Program on year-to-year basis. . . . ¶End of sub menace in Atlantic, improved conditions in Pacific reduce requirements for helium. . . . Cunningham, Kans., and Amarillo plants closed. . . . ¶Coal crisis, result of strikes and manpower shortages, likely to throw additional burdens on oil industry to keep war plants operating. . . . ¶Coal consumers who plan to convert to fuel oil destined to disappointment, PAW says. . . . No fuel oil available for them. . . .

PIPE LINES—Need for Texas-to-California crude line studied by Army-Navy Petroleum Board. . . . Its approval necessary. . . . ¶Construction of additional lines by Memphis Natural to move gas from Louisiana into Tennessee held up by stay order. . . . Louisiana opposes on conservation grounds. . . .

This damaged portion of a refinery at Balikpapan, Borneo east coast oil center, is typical of the war wreckage resulting from Jap destruction and invasion gunfire. PAW officials estimate 1 to 2 years will be required to repair the damaged facilities. (PAW Photo by Corsini.)

XUM

Seeligson Field Outstanding on Several Counts, Especially Its Multiple Pay Zones

by Charles J. Deegan

The Seeligson field, a major field by any standard, is remarkable for the multiplicity of pay zones, with forty odd separate zones identified. Ultimate recovery estimates are around 400 million barrels of oil and 1 to 1½ trillion cubic feet of gas, plus a large amount of condensate.

THE Seeligson field, straddling the Jim Wells-Kleberg County dividing line in South Texas is probably the most remarkable oil and gas field, from the standpoint of multiple pay zones, ever found in the United States. To date some 40-odd separate oil and gas reservoirs have been tentatively identified in the Frio and Vicksburg formations, and this includes the sedimentary column only down to —6,800 ft. There is one deep dry hole down flank on the structure, but as this was dry in all the upper pay zones, it cannot be considered as condemning the deeper possibilities farther up structure, so that the present number of pays may not be the limit for the field.

The field was discovered in 1937, and was originally known as East Premont, which was later changed to its present official name of Seeligson. It appeared to be only a fair oil pool until July 1941, when the discovery of Frio oil on the flank started it on an entirely new phase of its career. At present the field covers about 14,000 proven acres and it can hardly be said that its full potentialities are known, even though estimates of ultimate recovery run from a low of 325 million barrels to a high of 500 million barrels, averaging around 400 million barrels. In addition, the gas reserves are estimated at from 1 to 1½ trillion cubic feet, with no information publicly available on the condensate reserves, except that they will be very substantial.

Early History

The late Tom Slick was the man actually responsible for the discovery of this field, and his interest started in the early 1920's, when he obtained the oil rights on the 22,000-acre Jaboncillas Ranch, the eastern part of which, now known as the Seeligson Ranch, takes in large part of the proven area at present. In his big deal with the old Prairie Oil & Gas Co., a half interest in the Jaboncillas oil rights went to Prairie. After Slick's death, the Slick estate and Prairie dealt a one-half interest to the old Vacuum Oil Co. for a well, shortly before its merger with Standard Oil Co. of New York.

This well, Magnolia 1 Seeligson, located about 2¾ miles northwest of the nearest production, is reported to have been drilled on the basis of early reflection seismograph data. It was started December 26, 1931, and completed May 9, 1932, and was dry at total depth of 6,010 ft., but had some shows at around 3,400 and 4,900 ft.

On February 6, 1933, location was made for 2 Seeligson in the southwest corner of the ranch, on a gravity anomaly, and was completed March 31, 1933, good for about 85 bbl. of 24° gravity oil at 3,249-51 ft., to become the discovery well of what is now known as the West Premont field. Four more wells were drilled in this area, resulting in two small oil wells and two dry holes, the last one being completed July 2, 1935.

A new geophysical survey was made, and as a result it was indicated the main structure lay farther east. The real discovery well of the Seeligson field, Magnolia 7 Seeligson, was drilled on the basis of these data and on November 5, 1937, flowed 912 bbl. of 36° gravity oil from the Vicksburg at 6,585-95 ft. Later the well went wild, caught fire and burned up. Today this well is considered the real discovery well of all Frio gas sands and Vicksburg oil. Eight more oil wells were completed on the Seeligson Ranch, and during this period the Transwestern Oil Co. was organized and took over the Slick Estate interests. Later the Transwestern 1 Dunlap, completed November 19, 1938, extended the field 1½ miles south, finding production in the Vicksburg at a total depth of 6,766 ft.

On July 10, 1941, Transwestern 2 Dunlap, 3,100 ft. east of 1 Dunlap, found Frio oil at 6,091-94 ft., flowing 158 bbl. of 40° gravity oil through a 7/64-in. choke, and is today considered the key well that really started the field on its way to major caliber.

The field is on an anticlinal fold in the Vicksburg Flexure trend, along which numerous other fields have been found, although to date, none of them equals Seeligson in the multiplicity of pay zones. The anticlinal fold is formed by closure on the downthrow side of a regional fault zone, and there are two separate highs within the closure, known as the north and south domes.

The production comes from lenticular sand zones in the Frio and Vicksburg in the approximate interval of 2,500 ft. of vertical section between —4,300 and —6,800 ft. Of the 43 tentatively identified pay zones, 21 are now producing oil and gas; the others will probably eventually produce gas and condensate. None of the gas and condensate zones is now being produced, gas from the oil zones being ample for all field needs.

Pay Zones

Fig. 1 and Table 1 give some conception of the various pay zones, as they are now identified and indicate how complex a problem faces the operators, engineers, and geologists in deciding how best to produce the field. In order to clarify the various problems involved, the operators have three separate committees: (1) geological, (2) engineering, and (3) gas.

Since the sands are lenticular, not all oil or gas zones are found under every location. However, it is estimated that the average well in the field will find about four gas zones and three to four oil zones, with a combined pay thickness of 250 to 300 ft. for both oil and gas zones.

It is difficult to make generalizations in a field so complex, but generally the south end of the field seems to have somewhat better sand development than the north. Also the shallower gas and condensate zones seem to run leaner in condensate content than the deeper zones. While some sands go across both the north and south domes, and produce oil under both of them, other sands are found productive in only one part of the field, even though the sand appears to go across both domes and the water level in the oil-producing area appears to be low enough to permit accumulation under both domes. Naturally some of the more lenticular zones

produce only over a small area. With 40-acre spacing and such complex sand conditions the geologists working in the field occasionally have a feeling they never will be able to unravel all the details of the various sand lenses.

Engineering

The field started its development on a basis of 40-acre spacing, completing in only one sand, and all leases have been divided up into 40-acre drilling units. However, a large number of the wells have since been dually completed. Plans are now under way to go to a 20-acre spacing, with each well dually completed in two oil zones, but no duplication of oil zones within a 40-acre unit. The net result will be that each 40-acre unit will be producing from four oil zones through two wells, but no oil reservoir will have more than one well to 40-acre density.

This will call for a substantial drilling program, perhaps doubling or more than doubling the present number of oil wells. Also since under Railroad Commission rules, the oil from each reservoir must be segregated and measured separately from each well, every well must be equipped with two flow lines, and either metering devices, or separate tank batteries set up for each zone. In some cases separate tank batteries will be necessary in any event, since the oil varies in gravity and varies considerably in its value for 100-octane gasoline production.

One of the outstanding examples of the problems peculiar to this field is the case of Zone 20 and the Railroad Commission proration rules with respect to its production. The operators recognize eight separate sands in Zone 20, namely 20-A, B, C, D, E, F, G, and H. While 20-A, B, and C are all separate oil reservoirs, they have the same gas-oil contact level and the same oil-water contact level, and are so close to each other in the vertical section that if 20-A produces oil, then 20-B and C will be below the oil-water level in that well; or if 20-B produces oil, then 20-C will be below the water level. By mutual agreement between the operators and the commission, to simplify the problem of allowables the Railroad Commission treats 20-A, B, and C as one reservoir and fixes an allowable which it labels Zone 20 and includes all oil wells in 20-A, B, and C combined. Zones 20-E and F, the other oil pays, have their own separate allowables.

While the original reservoir pressures were normal for depth in the shallower zones, high-pressure gas zones are encountered below 6,250 ft., in which pressures run as much as 500 psi. above normal.

Porosity and permeability, of course, vary from zero upward, since the lenticular sands grade off into shale. However, most of the good oil sand runs an average porosity of about 25 per cent. Permeabilities vary both vertically and laterally, and range from zero to 1,200 millidarcys.

The engineering committee has not been able to decide whether there is any water drive in the field. There is definite evidence of gas expansion, but as yet no positive evidence of a water drive, although the question is still open. Zone 19-C, which has about half the total oil allowable at this time, had a pressure drop in the 6 months ending June 1, 1945, of about 60 psi., from an average of about 2,710 to 2,650 psi. In this period it produced about 50,000 bbl. per pound pressure drop.

Drilling and Completion

At the present time drilling is considered no problem, except for those wells that go deep enough to get into the abnormally high-pressure

(Continued on page 81)

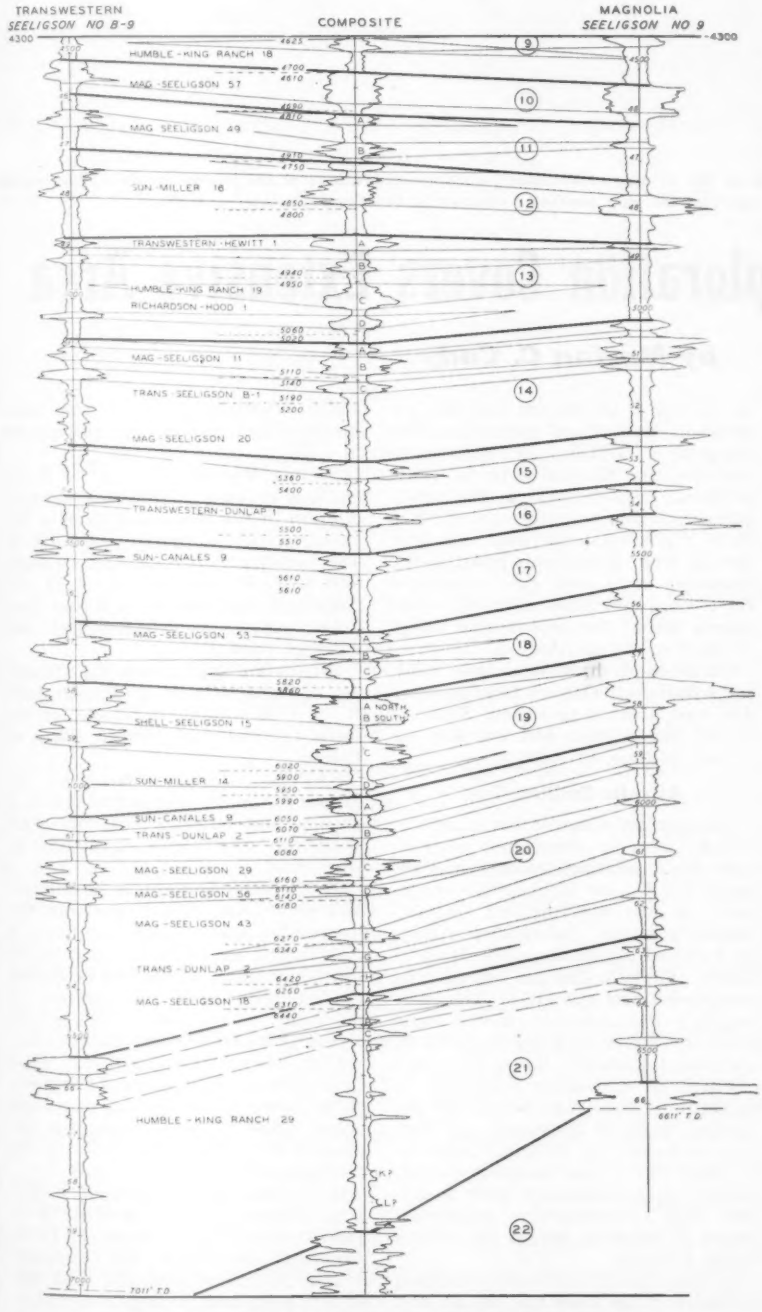

Fig. 1—Type electrical log, showing zone and sand correlations (From Texas Railroad Commission)

Exploratory operations superimposed in black on the oil map of Venezuela shows extensiveness of the testing program. The central mountain range has been cut from the map because it contains no fields or exploratory operations

Venezuelan Exploration Covers Extensive Area

by Marian C. Cody

CARACAS.—Interest in Venezuela's widely scattered exploratory tests, extending from prospective areas west of Lake Maracaibo to Delta Amacuro in the extreme eastern part of the country, has been heightened by recent completion of a new discovery by Creole Petroleum Corp. More than a dozen exploratory wells are at various stages of progress.

Aside from Creole's new discovery south of Maturin, the first to be made on a concession granted under the 1943 petroleum law, most interest centers on Caribbean Petroleum Co. R-801, in the heart of the old Cabimas field on the east shore of Lake Maracaibo. Caribbean's exploratory well is the deepest yet drilled in South America and will resume operations at the shutdown depth of 13,033 ft. as soon as necessary materials can be procured. The R-801 well is 4.5 kilometers due east of Punta Icotea and was projected for exploration of deeper pays from the time it was started in February 1944.

Operator is awaiting delivery of additional pipe for continuing below 13,033 ft. The hole is reported in satisfactory condition and drilling is to be continued until deep productive possibilities are fully explored.

Caribbean is using R-801 as a training ground in the use of modern, heavy-duty equipment for 20 Venezuelan apprentices of the drilling department.

Nine companies are participating in the current exploration program with others preparing to start operations as soon as equipment can be provided. Caribbean has two additional exploratory operations. The company's DM-3, 25 kilometers northwest of Maracaibo in the State of Zulia, is an outpost in the newly discovered and recently named Mara field which contains only one producing well. Caribbean DM-2 is the discovery well and was completed for a good producer after the company's initial test in the area failed to develop commercial oil.

Caribbean's third Venezuela wildcat, 1 Ballenato (BA) is 25 kilometers due east from Lagunillas, State of Zulia. The wildcat test was last reported drilling at 8,350 ft.

Atlantic Drilling Two

Venezuelan Atlantic Refining Co., which last year completed negotiations for operating interest in Pantepec Oil Co. of Venezuela concessions, is currently drilling two exploratory wells. Venezuelan Atlantic 1 Morichito, north of the Mulata-Santa Barbara-Jusepin producing area, is drilling at 5,116 ft. The company's 1 Punta Gorda, in the same general area, is drilling at 5,325 ft.

Creole 1 Capacho, the new discovery well 30 kilometers southwest of the Mulata field, was completed for 150 bbl. daily of 23-gravity oil from pay perforated at selected intervals at 4,410-70 ft. The company is following up its discovery with a second test immediately northwest called 2 Capacho which is drilling below 4,450 ft.

Orinoco Oil Co. (Pure) is drilling 2 Calentura between the Netick and La Concepcion producing fields west of Lake Maracaibo in the State of Zulia. Drilling progress was temporarily interrupted by a fishing job at 5,871 ft.

Socony Vacuum Oil Co. of Venezuela is making another try for production in the Barinas area at 1 Silvestre which is drilling at 5,648 ft. The location is 29.5 kilometers south and 42° east from the town of Barinas and is northwest of 1 San Vencente which was abandoned last April at 7,082 ft.

Richmond Exploration Co. (Standard of California) is drilling at 3,600 ft. at 1 Montania, northeast of the town of Pedregal in the State of Falcon.

SAP Las Mercedes has made location for a mountain front test, 1 Camaz, but drilling will not start until the dry season, probably in December.

The wildcat location is 29 kilometers south and 65° west from the town of Lezoma. The company is considering an alternate location for another wildcat which will be drilled immediately, pending cessation of the rainy season which will permit access to location for 1 Camaz.

Mene Grande Oil Co. (Gulf) 1 La Ceiba, about 50 kilometers southeast of the town of Barcelona, is drilling below 7,084 ft., after operators cemented 8⅝-in. pipe at 7,047 ft. No production test has been made.

In extreme eastern Venezuela, The Texas Petroleum Co. is drilling at 5,630 ft. at its No. 4 test in the Delta Amacuro concession. The company drilled No. 2 well as the first test in the area and it was a dry hole. No. 1 well was completed as a producer and No. 3 has not started.

FOUNDED IN 1910

BY PATRICK C. BOYLE

the OIL AND GAS JOURNAL

System Worth Saving

THE petroleum industry's stake in the current study of the United States patent system is uncommonly high. Much of the scientific progress made by this industry's technologists may be credited directly to the patent system. It has furnished the incentive for scores of inventions in the processing of crude oil without which the war might be swinging in favor of the Axis.

There is no denying that abuses have occurred. Unscrupulous uses of the patent system are not to be condoned. But the system is basically sound and provides a medium through which the art of petroleum refining has developed to serve mankind in thousands of ways. It can continue to serve as a potent inducement to inventive thinking.

Many constructive changes may result from the searching inquisition to which the patent system is being subjected. The important thing is that all interested have been invited to express their opinions. There are no preconceived schemes for radical change, except among cranks and a few pressure groups.

Consideration so far by the President's committee has been entirely objective. Composition of the committee indicates that its inquiry will be sustained at the highest possible level. Its members are William H. Davis, director of economic stabilization, chairman; Tom C. Clark, attorney general; Vannevar Bush, director of scientific research and development, and Charles F. Kettering, chairman of the patent planning commission. All are in high positions because of ability and judgment.

Topics suggested for discussion in the patent system investigation indicate that the committee will seriously consider ways of speeding up the process. Dissemination of improvements to prior arts, which collectively constitute a bulwark around scientific development, is discouragingly slow under the present system. Improvements on a previous invention, regardless of how important they may be from standpoints of utility and commercial application, have inadequate protection.

Critics of the patent system are inclined to overlook its paramount advantage. The patent laws reserving benefits to the inventor for 17 years produce the revenue and the incentive for constant research. Royalty payments for the privilege of using an invention in competitive commerce are the only means of support for some of the industry's outstanding research organizations. If compensation for the use of patented processes and machines should be severely regulated, vitality of industry to carry research forward would be seriously reduced. Interference with normal procedure could have inimical repercussions.

Probably the most dangerous threat to private initiative in the field of invention is the alternative that government would usurp the work of industry. Centralized federal control over invention is a first step toward socialized industry.

Developments in refinery processing and producing practices have enabled the industry to meet every wartime call, quantitatively and qualitatively. These have resulted from private invention and improvement, inspired and sponsored by the industry's great research organizations. Individual initiative has been combined with adequate reward to produce gratifying results. Certainly the petroleum industry has everything to gain by making a vigorous brief for retention of a system under which it has achieved unprecedented progress. Some modifications are in order, but the basic structure should be retained.

XUM

INTERNATIONAL

French Satisfied With Plan For Refineries in Levant

WASHINGTON.—The French foreign office is satisfied, according to information received here, with an agreement under which two American oil companies are permitted by the Lebanese Government to build two refineries near Tripoli, some 40 miles northeast of Beyrouth. The companies are Mediterranean Refining Co., subsidiary of Socony-Vacuum Oil Co., Inc., and Mediterranean Standard Oil Co., subsidiary of Standard Oil Co. (New Jersey).

French interest derives from the fact that the mandate over the Levant states was assigned to France at the San Remo conference, and that country has found itself facing diplomatic problems with other United Nations regarding the termination of the mandate.

The agreement, which will be submitted to the Lebanon legislature for ratification at the October session, was negotiated by F. C. Le Rocker, of New York, Socony-Vacuum manager in the Levant, and O. A. Seager, of Standard Oil in discussions with Premier Abdul Hamed Karamy and Foreign Minister Henri Pharon.

Work on the new refinery of Arabian American Oil Co. at Dharan, on the Persian Gulf coast, opposite Bahrein Island, is being rushed under the supervision of American technicians. It was expected the plant would not be completed before the end of the year, but it is believed now it may be finished by October.

Union Doing Geophysical Work in Paraguay

In accordance with an agreement made with the Paraguayan Government last year, Union Oil Co. recently completed 7 months of geophysical work in the Gran Chaco district of Paraguay and is now only about 75 miles from the Bolivian boundary. This work runs roughly from east to west on a reconnaissance basis and detailed work on special areas will be undertaken later. This agreement covers 50,000,000 acres of flat, heavily covered with jungle vegetation and other impedimenta. Geophysical crews are using military roads across the area. Union has until July 1, 1946, to start its first wildcat which will probably be drilled by drilling contractors. The agreement runs for 50 years with the customary extension of time during production activities.

If production is developed Union will have to construct pipe-line facilities to tidewater or barge oil down the Parana and adjacent riverways. Paraguay being an interior republic with no outlet to the sea will have the advantage of so-called free ports which today are being used in the movement into and out of the country. Because of the high Andes Mountains the most advantageous outlet is to the east to the Atlantic Ocean. If production is developed it is the intention of Union Oil Co. to erect sufficient refining facilities to take care of the demand and for export. Paraguay will rereceive a graduated royalty from any production developed.

Capt. Ramon Martino, Minister of Public Works and Communications, arrived in Los Angeles July 26 for a visit with Union officials after which he will proceed to Washington. He will discuss with Washington the possibility of acquiring ships as a nucleus for a proposed Paraguayan merchant marine. It is felt with its own merchant marine it will be able to move commerce to any part of the world through the free ports.

In order to facilitate exploration work, Union is permitted to bring in all necessary technical labor but will in the future employ as much native labor as possible. It is proposed to school native Paraguayans in the United States if results of exploration warrant.

Another geophysical party will move into the area shortly and work north and south from the initial line of shooting. The area involved is flat table land with no prominent elevations that might suggest structures and dense vegetation hindering movement and preventing observation. Aerial observation is of no value and is not being employed except for ingress and egress. Asuncion, the capital, is, however, on a regular air-line run.

Colombian Exploration Costs Are Revealed

Figures covering the cost of exploration in Colombia by one company for a period of 11 years have been reported by the Colombian Oil-News Digest. Total outlay for the 11-year period up to December 31, 1944, amounted to $11,000,000 (19,307,761 pesos).

Of the total $11,000,000 invested in exploration, drilling expenses took $5,412,500, or an average of $387,000 per well, since 13 wildcat wells were completed and one drilling at the time of the report. Expenses were broken down as follows: Drilling expense $2,040,000; surface exploration, geology, geophysics, and mapping $3,180,000; road construction and maintenance $192,500. The figure of $387,000 per well excludes capital investments. On a per foot basis, the cost averages $65.70 per foot drilled. Three concessions were tested and testing operations were started on a fourth.

The company has earmarked $6,520,000 for exploratory work in this country in 1945, which will make a total of $17,500,000 spent by the end of 1945.

Shell's Reconstruction Plans Fully Formed

Plans for reconstruction of damaged petroleum assets in the Netherlands East Indies are well advanced, according to the annual report of the Royal Dutch company which was released in this country last week. Liberation of the East Indies "will not find us unprepared and the speed of reconstruction will only be restricted by the supply of material for the purpose," the report declared.

From other sources it was learned that the Royal Dutch company and Standard-Vacuum Oil Co., largest operating companies in portions of the East Indies still under Japanese occupation have intensified plans for reconstruction of petroleum facilities. The companies, working in close collaboration with military authorities, have placed extensive orders for all types of equipment and have arranged for special services considered likely to be needed in reconstruction work. Temporary repairs have restored the capacity of Astra Romana (Shell) refinery in Romania to approximately 77 per cent of the prewar figure, the Royal Dutch report revealed.

Romanian fields, the report disclosed, have not been greatly damaged and at the end of 1944 the daily production was about 85 per cent of the prewar level.

Casabe Pay Proven Under Tropical's DeMares Pool

Tropical Oil Co. 1 Galan, a test on the east bank of the Magdalena River in Colombia to explore the Casabe pool pay under the DeMares concession, is understood to have given assurance of production on the basis of electrical survey. The well was last reported drilling at about 4,200 ft. and probably will be completed at 4,500 ft. Electrical survey indicated about 1,000 ft. of oil-pay section.

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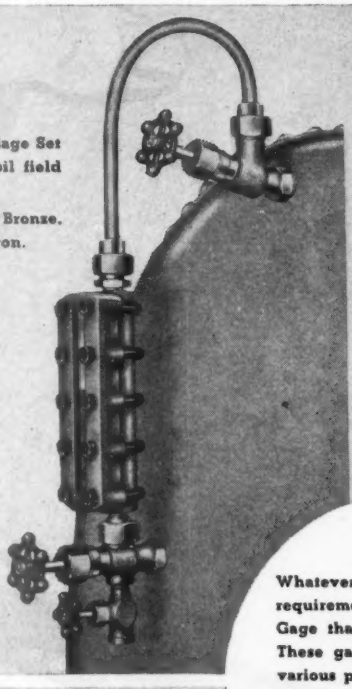

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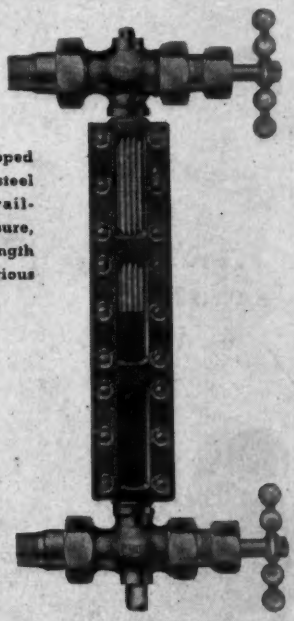

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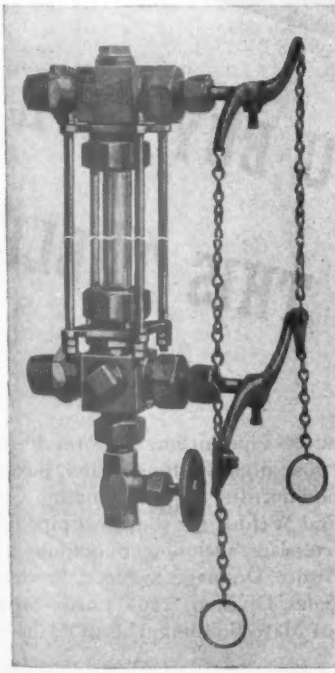

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8	x	x	S	S	S	x	x	S		
8 5/8	x	x	S	S	S	x	x	*x	x	
10	x	x	S	S	S	x	x	S	x	S
*10 3/4	x	x	S	S	S	x	x	S	x	S
12	x	x	S	S	S	x	x	S	x	S
12 3/4	x	x	S	S	S	x	x	S	x	S
14	x	x	S	S	S	x	x	S	x	S
16	x	x	S	S	S	x	x	S	x	x
18	x	x	S	S	S	x	x	S	x	x
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28										
30										
36										

*—10 3/4" OD is furnished in .279" wall, not .281".
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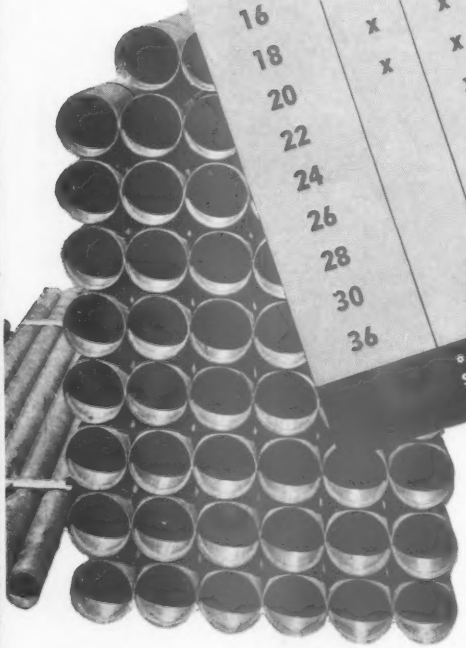

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TABLE 1—DATA ON SEELIGSON FIELD—JIM WELLS—KLEBERG COUNTIES, TEXAS—SANDS RECOGNIZED AS OF JULY 1, 1945—FIRST SAND IS NO. 9

Pay sand number	Gas condensate found	Oil & Gas found (*Possible pay)	Oil allowable July 1, '45	No. oil wells July 1, '45	No. oil wells Jan. 1, '44	Gravity of crude	Remarks
9	Gas	...	...	...	...	...	
10	....	Oil & Gas	557	7	0	39.9°	
11A	Gas	...	...	...	...	...	
11B	Gas	...	...	...	...	...	
12A	Gas	...	...	...	...	...	
13A	....	Oil only	2,068	32	16	36.1°	No gas cap
13B	None	*	...	...	...	...	
13C	....	Oil & Gas	128	2	0	40.3°	
13D	Gas	...	...	...	...	...	
14A	....	Oil	...	...	...	...	
14B	....	Oil & Gas	3,778	71	49	37.2°	
14C	....	Oil	...	...	1	...	Not being produced now
15	Gas	...	...	...	...	...	
16	....	Oil & Gas	834	8	1	40.9°	
17	....	Oil & Gas	190	4	3	37.2°	
18A	....	Oil & Gas	29	1	1	42.1°	
18B	....	...	...	...	...	...	May be same as "A"
18C	Gas	...	...	...	...	...	
19A	....	Oil & Gas	334	3	1	39.4°	
19B	....	Oil & Gas	3,158	29	10	41.1°	
19C	....	Oil & Gas	18,584	161	101	43.0°	
19D	....	Oil only	1,479	13	1	41.3°	No gas cap
20A, 20B, 20C	....	Oil & Gas	3,456	34	19	40.0°	20 A, B, and C lumped in fixing allowables by R. R. Comm.
20D	Gas	...	...	...	...	...	
20E	....	Oil & Gas	140	1	1	41.4°	
20F	....	Oil & Gas	23	1	0	43.8°	
20G	....	*	...	...	...	...	
20H	....	*	...	...	...	...	
21A, 21B	Gas	...	...	...	...	...	
21C	....	Oil & Gas	...	...	...	...	
21 D, E, F, & G	Prob. Gas	*	...	...	...	...	
21H	....	Oil & Gas	116	1	0	41.2°	
21I	....	*	...	...	...	...	
21J	....	Oil & Gas	116	1	0	40.6°	
21K	....	*	...	...	...	...	
21L	....	Oil & Gas	232	2	0	40.2°	
22	....	Oil & Gas	812	7	7	36.5°	
Total			36,024	378	211		

Seeligson Field Is Outstanding

(Continued from page 75)

gas zones below 6,250 ft. This was not true in the early days, and some wells encountered a great deal of trouble that cost the operators dearly. Now it is considered routine to take an ordinary drilling rig, set 1,000 ft. of surface pipe and land either a 5½-in. or 7-in. oil string at 6,000 ft.

Because there is plenty of good water available at about 450 ft., and lots of gas in the field, most of the drilling is done with steam rigs. Current contract prices are reported to run about $3.00 per foot, with contractor furnishing the derrick and doing his own moving, operator furnishing fuel and water. Except in rare cases of extremely wet weather, there is no difficulty in moving heavy equipment around the field. The soil is fairly sandy and a paved highway runs right through the middle of the field.

The average drilling well uses about $1,000 worth of special muds, of which about 60 per cent will be for baroid and 40 per cent for aqua gel and chemicals. Some companies start drilling with a little commercial mud, believing they get through the shallow fresh water sands more easily; others do not follow this practice. Aside from this, little attention to mud is necessary, and no check is made on water loss until about the 4,000-ft. level, where the producing zones begin. From this point the mud will vary from 10.9 to 11.6 lb., with viscosity held between 40 and 60 seconds, and common practice is to hold water loss down to 10 cc. or less.

Practically all of the wells now drilled are dual completions and the general practice is to set about 1,000 ft. of surface pipe, then land either a 7-in. or 5½-in. oil string through the lower pay. Tubing is run to produce the lower pay, and a packer set below the upper pay, which is then produced between the casing and tubing. In a few cases where the upper zone is weak and lacks kick, a crossover packer is used and the upper zone produced through the tubing and the lower zone through the casing.

There are quite a few company rigs drilling in the field, but among the contractors, the most active in this field are Al Buchanan, Allen-Morris, Fitzpatrick Drilling Co., and W. O. Richardson.

Gas and Condensate

The gas zones represent a very large reserve, which is not being produced at this time. The lenticular nature of the sands will pose some difficult problems when it comes to spacing. Likewise, the reported variation in richness of condensate content adds other problems. The obvious solution is unitization of the gas and condensate zones, and it is reported that plans are rather far along for completion of such an agreement and the installation of a cycling plant for recovery of condensate.

In addition to unitization of gas and condensate zones, the absence to date of any positive evidence of a water drive in the oil sands, the lenticular nature of the oil reservoirs, and the presence of large volumes of available gas when the cycling plant is built, all add up to an extremely attractive prospect for unitization of the entire field, both oil and gas. Then gas from the cycling plant could be returned to the lenticular oil sands to maintain reservoir pressures until all the recoverable oil is flowed, then the gas recovered, processed through the cycling plant and the residue sold as dry gas.

These factors are known to have been considered by the geologists, engineers, and executives of the operating companies, but no official information is available as to how far discussions have gone.

XUM

Exploration in Pacific Northwest Draws Interest

PORTLAND—As The Texas Co. 1 Clatskanie, NE 36-7n-4w, Columbia County, Oregon, continued to make hole below 2,500 ft., exploration activity in Washington and Oregon is arousing interest. The Clatskanie test is on logged off timberland owned by the Benson Timber Co., and within ½ mile of a tract of 95,900 acres of leases acquired from Columbia County. The land, which came to the county via tax delinquencies, was acquired for a bonus of $16,500 (about 17 cents per acre), with an annual rental of 15 cents per acre, plus certain drilling clauses.

The Sharpless Corp. has just abandoned its third test near Aberdeen, in Gray's Harbor County, Washington, due to mechanical difficulties encountered about 3,300 ft., but is moving equipment a few miles to start a fourth well. This company is reported to have over 60,000 acres under lease.

Geophysical activity is under way in the Willamette Valley of Oregon, where crews of Standard Oil Co. of California, Texas Co., Union Oil Co., and others are reported working. Shell Oil Co., Inc., and Amerada Petroleum Corp., are reported to have had crews working in this same area a few months ago.

Richfield Oil Co. has opened offices in Portland, and has 7,500 acres under lease nearby.

Wolf Succeeds Forward As Key Man in A.G.A.

NEW YORK.—H. Carl Wolf, president of Atlanta Gas Light Co., has been named managing director of American Gas Association to succeed Alexander Forward, who has filled the post since 1923 and is retiring from active business. The changes will become effective October 1.

Wolf, who received his bachelor and masters degrees in electrical engineering at University of Illinois, entered the utilities field as assistant engineer for Illinois Commerce Commission and later became manager of Edwardsville (Ill.) Water Co. In World War I he was a captain in the Engineer Corps. From 1922 to 1929, Wolf was chief engineer of Public Service Commission of Maryland. He became assistant to the president of Central Public Service Corp., later was elected vice president of Consolidated Electric & Gas Co., and then president of Central Indiana Gas Co. He was elected president of Atlanta Gas Light Co. in 1938. He has been a director of A.G.A. since 1941. He is past president of Indiana Gas Association and Southern Gas Association and past chairman of the Industrial and Commercial Gas Section of A.G.A.

Forward began his business career as a newspaperman. He was secretary to the Governor of Virginia from 1914 to 1918; attended military training camp at Plattsburg in 1916 and was appointed president of the Virginia division, Military Training Camps Association, charged with examination and recommendation to the War Department of candidates for officers in World War I. He was appointed a member of Virginia State Corporation Commission in February 1918, but obtained leave of absence to become director of relief supplies to the Balkan States. He returned to the Virginia commission, but resigned in 1923 to become managing director of A.G.A.

Seismograph Service Not Interrupted by Fire

Fire which damaged a building of Seismograph Service Corp., Tulsa, August 3, caused no interruption of the company's activities. A garage, several automotive units, and machine tools for garage work were destroyed, and some supplies for seismograph crews were damaged. The company's main offices, laboratories, and a large warehouse were not affected by the fire, G. B. Westby, president, said, and there was no break in the servicing of field crews anywhere or in construction of equipment for new crews for foreign work.

Paleozoic Stratigraphy Of Colorado Summarized

GOLDEN, Colo.—The July issue of the Colorado School of Mines Quarterly contains an article "A Resume of the Paleozoic Stratigraphy of Colorado" by Dr. J. Harlan Johnson, associate professor of geology. This summary of available information on the Paleozoic formations, including extensive bibliographical references, will prove timely in view of the current interest in Paleozoic oil possibilities in northwestern and southeastern Colorado.

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This issue of The Oil and Gas Journal can be mailed to any service man in the United States for 6 cents.

Due to weight restrictions, it cannot be remailed to an APO or Fleet address unless requested by a service man.

McWilliams Resumes Position With Carter

J. R. McWilliams, for the past year director of production, Petroleum Administration for War, with headquarters in Washington, returned to Tulsa this week to resume his duties as vice president and director in charge of the production department of the Carter Oil Co. He will also assist in handling public and industrial relations matters.

McWilliams was named to the PAW position in August, 1944, and at that time was granted a leave of absence by Carter.

As head of the PAW's production division, McWilliams directed one of the most important branches of the nation's petroleum resources war agency. It was his responsibility to coordinate efforts to keep the country's crude production at a peak to insure sufficient fuel for the allied war machine.

At the time of his appointment to PAW, McWilliams was manager of Carter's northwest division, at Billings, Mont. Before that time, he had served as manager of producing operations for Carter from May, 1941.

DEATHS

Dwight G. Safford, 49, superintendent of drilling and development for Stanolind Oil & Gas Co., died unexpectedly August 1 in Tulsa. Safford entered the oil business with the old Midwest Refining Co. at Salt Creek, Wyo., in 1921. Later he was employed by Eastland Oil Co. and Dixie Oil Co. in Texas, continuing with the latter company till it was taken over by Stanolind.

Harry E. Preston, formerly an independent oil operator in Tulsa, died July 30 in Dallas.

Lewis J. Hampton, 62, president and general manager of Bear State Oil Co., died last week in Los Angeles.

W. O. Young, field scout for Shell Oil Co., Inc., died unexpectedly at Great Bend, Kans., July 30, following a heart attack. He had been with Shell 15 years.

Wirt Davis, 71, long identified with oil, banking, and other interests in the Southwest, died August 3 in Dallas.

Adam Kurtz, 65, vice president and treasurer of Michigan Consolidated Gas Co. and nationally known in the public utilities field, died August 1 in Detroit.

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San Miguelito Is Outstanding Example Of Modern Oil-Field Engineering

by Kenneth B. Barnes

The "Little Mike" pool has been under continuous development since its discovery in 1931. Special roads plus deflected holes permit uniform subsurface development under the mountainous terrain. Individual well metering, three-stage separation, gasoline manufacture, and pressure maintenance are other features of the pool

IN going over the producing area of San Miguelito in Ventura County, California, one rises abruptly from the ocean along well-built roads to well sites that are sometimes in the clouds. Drilling often starts at derrick-floor elevations close to 1,000 ft. above sea level although the shoreline of the Pacific Ocean touches the southwest corner of the lease within less than a half mile of producing wells.

The abruptness of the rise of the San Miguelito anticlinal area exaggerates the precipitous appearance of these coastal hills. Nevertheless the Grubb lease is cut by deep canyons and almost vertical scarps which have called for a great deal of ingenuity in road building, buttressing slides, and controlling drainage channels. Altogether the development has called for the application of many functions of modern engineering before grass roots are ever disturbed by the drill.

The entire pool is covered by one lease, which has been under continuous development by Continental Oil Co. since the discovery well, 1 Grubb, was completed November

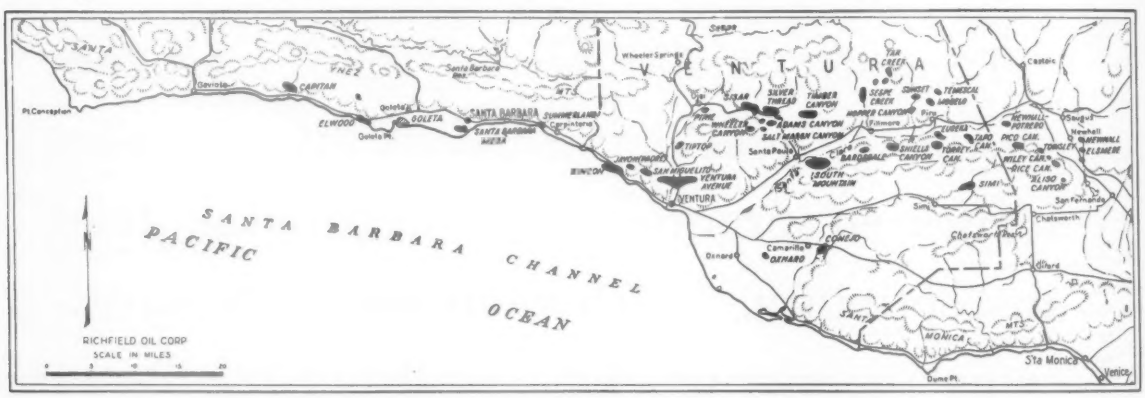

Fig. 1: Map of Santa Barbara-Ventura districts, showing oil and gas fields

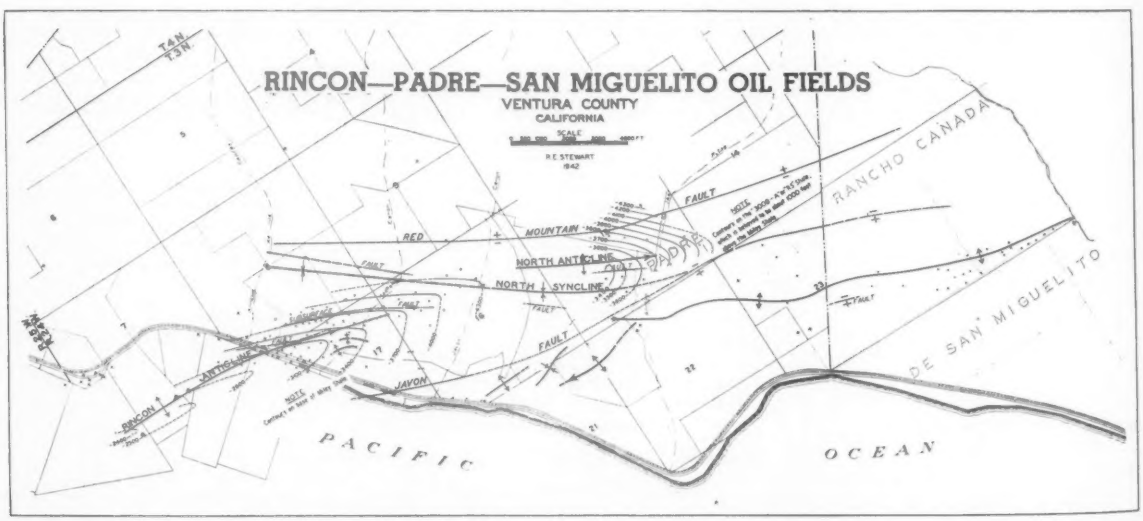

Fig. 2: Anticlines, faults, and structure in the (left to right) Rincon, Padre (Javon), and San Miguelito producing areas. (After R. E. Stewart, California Mines Bulletin 118)

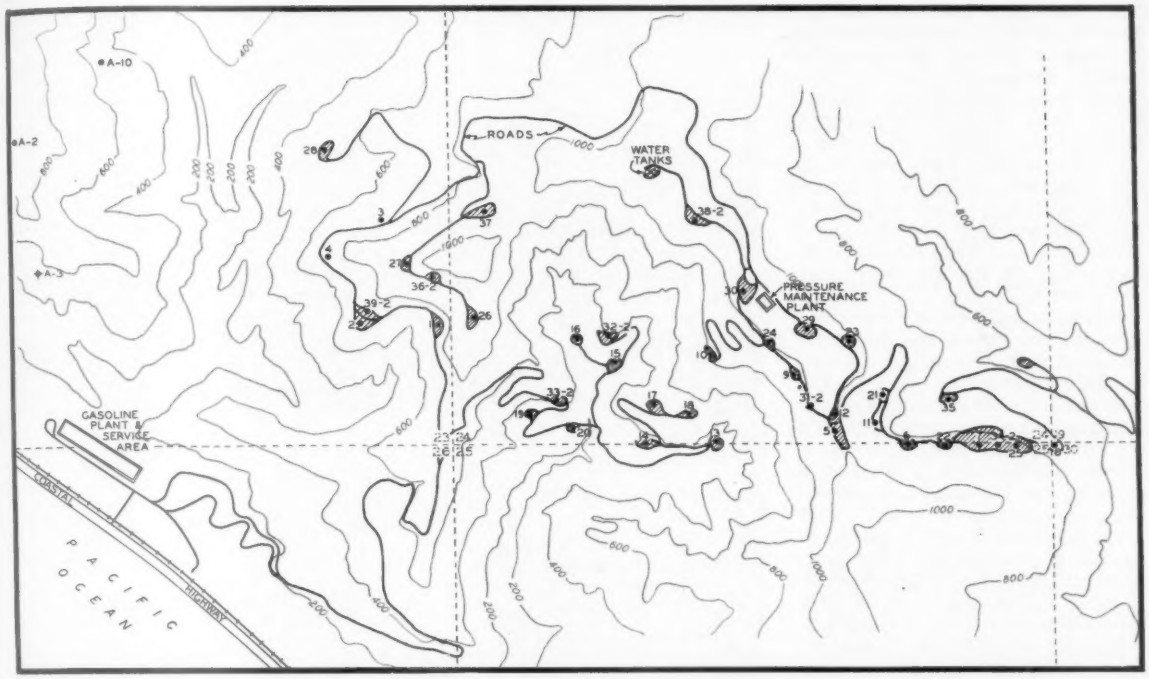

Fig. 3: Topographic map of San Miguelito pool, showing wells, roadways, location of plants. Contour intervals (red) are 200 ft.

22, 1931. Drilling activity and installation work goes on apace.

The project includes a systematized combination of drilling rigs, producing wells, line systems, electric-power-generating facilities, separation, treating and storage units, gasoline, and pressure-maintenance plants.

A few miles to the east is the Ventura Avenue field. Other pools lie westerly from Miguelito. They follow the coast line, more or less, in its east-west trend. It may be said that Ventura Avenue, San Miguelito, Padre Canyon, and Rincon are in structural trend. They are not all on the same anticline, however. Ventura Avenue was discovered by State Consolidated Oil Co. in 1917, San Miguelito by Continental Oil Co. in 1931, Padre Canyon by Continental in March 1936, and Rincon by Richfield Oil Co. in December 1927. All of the pools produce from Pliocene sands and the wells are mostly 6,000 to 8,000 ft. deep. The Rincon oil structure lies in part under the ocean and is developed by wells on piers. Fig. 1 shows the location of these fields in the district.

While the pools are closely adjoining and all anticlinal, there are present both major and minor faults, a graben area, pinchouts, different pay sands and zones, numerous geological complexities (Fig. 2).

Development of San Miguelito Pool

Present status of the development is shown on the topographical map comprising Fig. 3. A total of 37 wells has been completed. All are flowing except one where kickoff valves are being installed and one on sucker-rod pump. No dry holes or noncommercial wells have been drilled.

Two zones are producing. Top of the first occurs at 6,500 to 6,800 ft., depending on surface elevation and structural position. Top of the second zone, from which five of the present wells produce, is 6,750 to 7,750 ft. There are no dual completions.

Total sand penetration in the wells ranges from 800 to 1,200 ft. per zone.

To show the topographical sweep embraced in the fields, the three pictures in Fig. 4 carry one from the derrick floor of a drilling well on a pier location at Rincon through to a drilling location at San Miguelito which is on a mountainside overlooking the ocean.

Roads, Areaways, Directional Drilling

Access to the desired drilling sites has involved major excavating, filling, and road building over practically all portions of the property. This is shown by the topographic map (Fig. 3) and the four representative photographs of Fig. 5.

A total of 8½ miles of these oiled roads, which are carefully designed as to grade, turns, and guard rails, has been constructed. They are drained from slopes above, protected by mud dams, and at some places cross ravines by bridge work.

Although the productive area of the pool is but some 270 acres, the road distance from the plant and offices (elevation 25 ft.) on one side of the property is 4.8 miles to the two 5,000-bbl. water tanks (elevation 1,225 ft.) on the other side.

Casing Used for Drill Pipe, Finally as Liners

One to two company-operated drilling strings have been used in continuous development of the property, except for short intervals. Currently two wells, Nos. 39-2 and 38-2, are drilling. Steam equipment is used, the battery consisting of four 100-hp. insulated boilers and a superheater, all in unitized form with the pumps.

Development has been planned so as to drill as many wells as possible from one boiler setting. On some wells as much as 1,600 ft. of 6-in. welded, insulated line has been used to transport steam to the drilling well.

A surface string of casing, either 13⅜-in. or 11¾-in. o.d., is set at depths varying from 800 to 2,500 ft. The setting depth of this surface casing is controlled by local areas of lost circulation. In a couple of the mountainous locations, circulation was lost out of the hillside, and a few hundred feet of 20-in. conductor then was cemented to overcome this difficulty.

Record drilling times of 39 to 40 days have been set for the first-zone wells; about 60 to 90 days are required for the second-zone producers.

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In spite of the best that could be done to construct roads and drilling areaways, uniformly spaced surface locations were impossible to attain. Consequently, a considerable amount of directional drilling has been necessary.

As can be seen from Fig. 3, the result has been irregularly spaced surface sites, and to achieve the desired uniformity of formational drainage, intentionally deflected holes have been the rule rather than the exception.

In penetrating the pays electrical-log data are now used for determining completion procedure, although in the earlier and outpost wells considerable coring was done. An outgrowth of the excessive drill pipe repair costs which are prevalent in Ventura County drilling is the use of 5-in. threaded and coupled drill pipe which is 5-in. 18-lb. pipe with a specially designed thread of five round threads per inch with 1¼-in. taper. The design was invented and perfected by A. H. Bell, general superintendent of Continental Oil Co. in California. Worn collars are easily changed at the well.

A cross-section of the threading arrangement is shown in Fig. 6. After the drilling of a well is completed, enough pipe is withdrawn from drilling service to be used as a liner for its completion. This is particularly practical here, in a salvable sense, since the length of a liner in the wells may be 1,200 ft.

The liners are slotted and suspended up to 20 to 30 ft. into the 7-in. o.d. water string by liner hangers.

Producing Equipment in Field

Only a minimum of producing equipment is installed in the field proper. Except in a few cases, derricks are not left up. There is no field low-pressure separation of gas, no field storage or even test tankage. Besides a multiline fluid-handling system, the sole field equipment at the locations is shown in Fig. 7, and uniform installations have been made at all wells.

The 6,000-psi. test-pressure christmas-tree equipment is centered over a concrete mat fitted with steel eyes for mast or derrick and pulling-unit tiedowns. Usually a short distance away is set the individual first-stage separator for the well, operating at 430 psi. Often the separators for two wells are set adjacently.

Wet gas from the separator moves to the 425-psi. absorber at the gasoline plant through an 8-in. aluminum-painted trunk system. It is installed 6 in. or so aboveground on concrete and steel supports.

The high-pressure crude, either "dry" or "wet" as the case may be, moves to centralized second-stage (40-psi.) separators at the plant, and

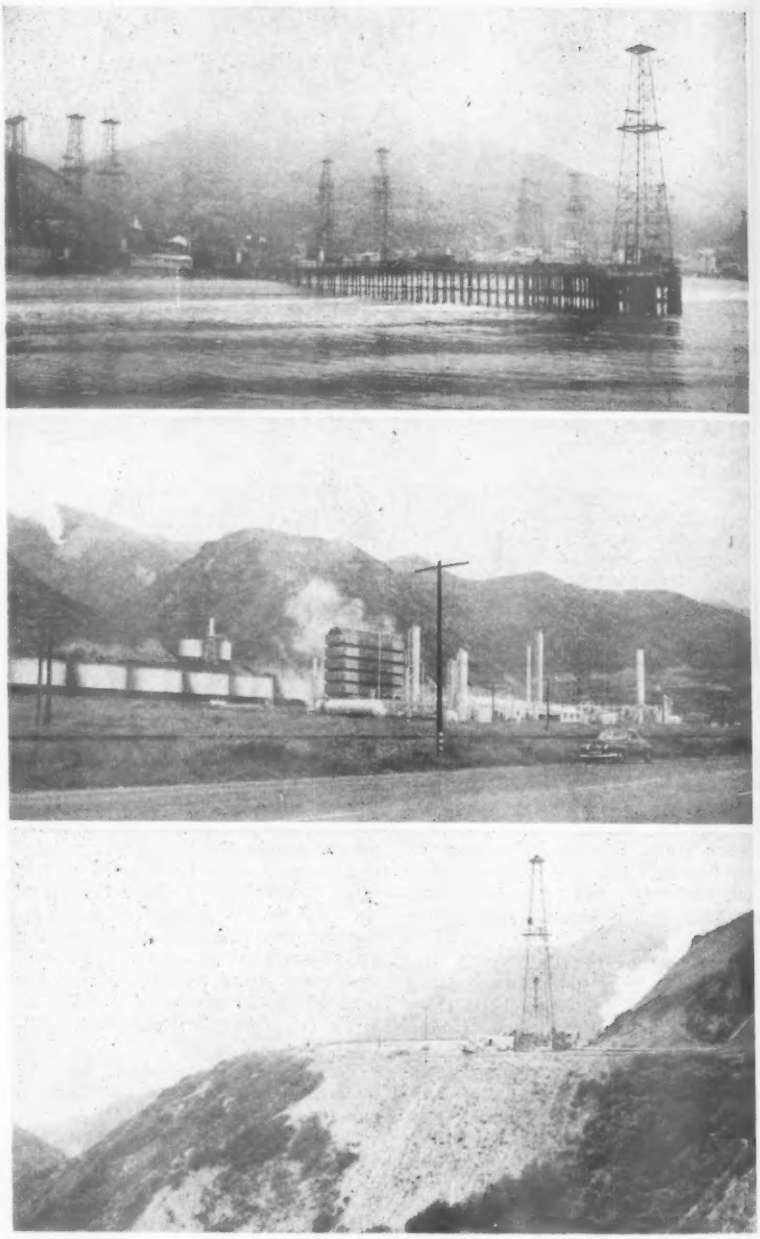

Fig. 4: (Top) Rincon oil field, looking shoreward from a drilling well on one of the piers. Fog in the mountains overhangs the Padre Canyon field. Center: Continental Oil Co.'s centralized plant operations on the southwest edge of the San Miguelito pool. The beach is immediately to the right of the road. Bottom: Continental's 39-2 Grubb currently drilling at a high location, yet near the ocean

for the latter kind, to electrical crude dehydrators.

Other line systems include low-pressure residue gas, and high-pressure gas return (425 psi.) to the pressure-maintenance plant. A 4,000-volt 44-wire power circuit from the generators at the plant and telephone lines grid the productive area.

As fresh water along the coast is hard, 7 miles of 6-in. line was installed to an intermountain water shed. The diesel pump operates at 630 psi. to overcome frictional losses of the movement and make the 900-ft. boost to the storage tanks. Water demands for the gasoline and pressure plants recently have necessitated installation of a 5-in. paralleling water line over part of the system.

Individual-Well Testing Facilities

To test individual wells, a bypass downstream from the oil dump

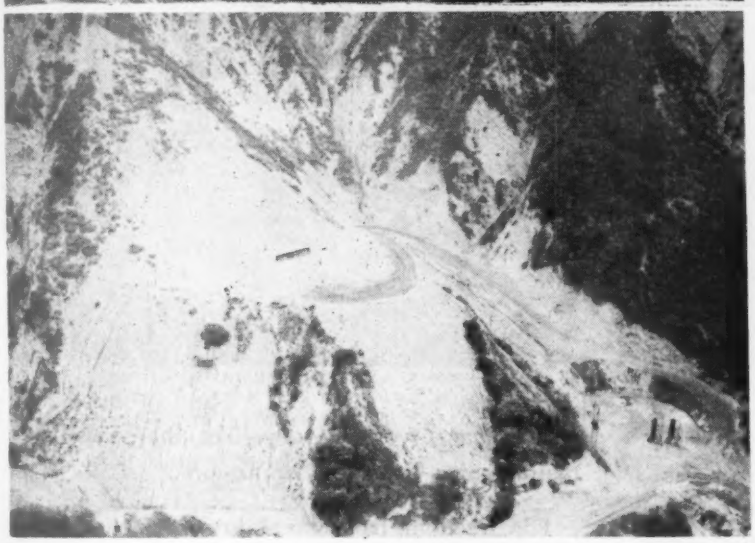

Fig. 5: The "Amphitheater," top view, is a large rugged bowl-like depression in the field, with the wells at the bottom having surface elevations of about 250 ft. while those on the surrounding mountains are 1,120 ft. Roads tortuously traverse the area. Views of a mountainside location are shown in the two pictures in the center of the page. In the view at right, note buttress protecting the wellhead from slides. The left view also shows the lower offsetting well, with the first-stage separators for both wells adjoining it. The picture at right, bottom, shows the building of a new road for more locations; on one side of it later will be permanently anchored the pipe lines now strung below

valve is connected to a positive displacement meter. The meter records the volume of high-pressure crude passed on a register counter.

From separation data always available at the plant, a shrinkage correction is applied to the meter readings to obtain normal stock tank volumes. This ordinarily is about 8 per cent.

The gas flow from the separator can be passed through a recording orifice meter incorporated in the permanent setting, for determining the first-stage gas volume. Second and third-stage gas volumes are readily computable from the continuously measured and gauged gas and oil volumes at the plant. In this manner accurate information on gas-oil ratios and productivity of each well are readily obtained.

Several Operations in Central Plant Area

At the central plant yard are located the second-stage 40-psi. separating units. Wet gas from these enters the low-pressure absorber. The crude passes to the third-stage atmospheric separator, and after final stabilization, to the storage batteries.

There are two 3,750-bbl. working and six 5,000-bbl. storage tanks. Gravity of the crude is 33°. Separated gas is recompressed for entry into the 38-psi. absorber.

The electrical crude dehydrators also adjoin this area. Fig. 8 is a photograph of the above equipment.

Gasoline and Pressure-Maintenance Plants

Total gas to the gasoline plant is 20 to 21 million cubic feet per day and approximately 15,000 gal. per day of 47-lb. r.v.p. gasoline is manufactured. No liquefied petroleum gas products are now made, as the raw material is shipped elsewhere for

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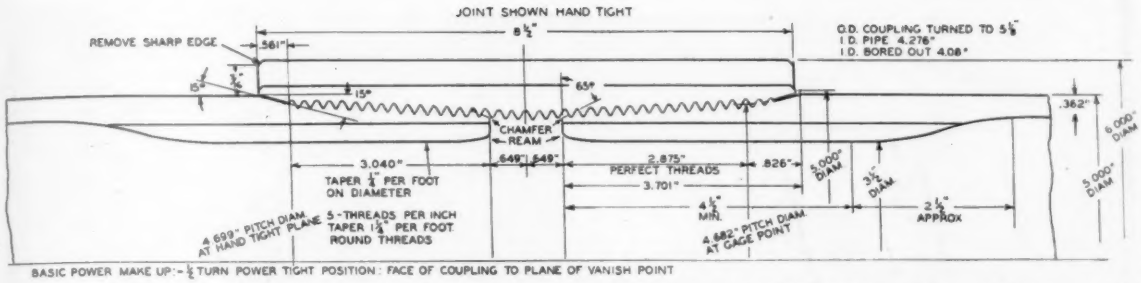

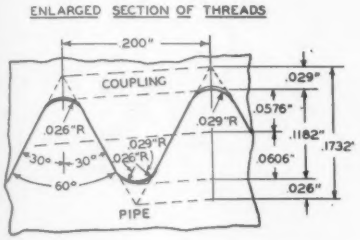

Fig. 6: Detail of special threaded and coupled drill pipe joint made from 5-in. 18-lb. internal upset drill pipe. (Courtesy A. H. Bell)

fractionation, including one for isobutane.

Bulk of the residue gas, approximately 18,000 M.c.f. per day is at 425 psi. and available either for sale or return to the formation. Part of the 1,500 M.c.f. per day from the low-pressure absorber is used for fuel; the rest is compressed for sale or sent to the pressure-maintenance plant.

Pressure Maintenance Operation

Further compression of the residue gas for injection is not made at the central plant, but at the intermediate pressure is transported to a mountainous midpoint (true central position) in the pool. Here two stages of compression boost the gas to 2,500 psi. for return to the reservoir through 24 Grubb, the present injection well.

The plant building originally housed one 300-hp. angle unit, but an extension is being made and a second machine added.

In summary with noting the careful completing, producing, and pressure-maintenance work that has been done, it is of interest to note that the property already has recovered 11 million barrels and that even the discovery well, after 13 years, is still easily capable of flowing better than 250 bbl. of oil per day.

F. N. Bosco is returning to active professional practice at Denver, after 34 months with the Army Engineers. He made a study of the eastern half of Colorado for oil possibilities in 1941.

Noyes B. Livingston has resigned as chief geologist for Yacimientos Petroleos Fiscales Bolivanos at the completion of his 2-year contract and will return to his home in Fort Worth, Tex.

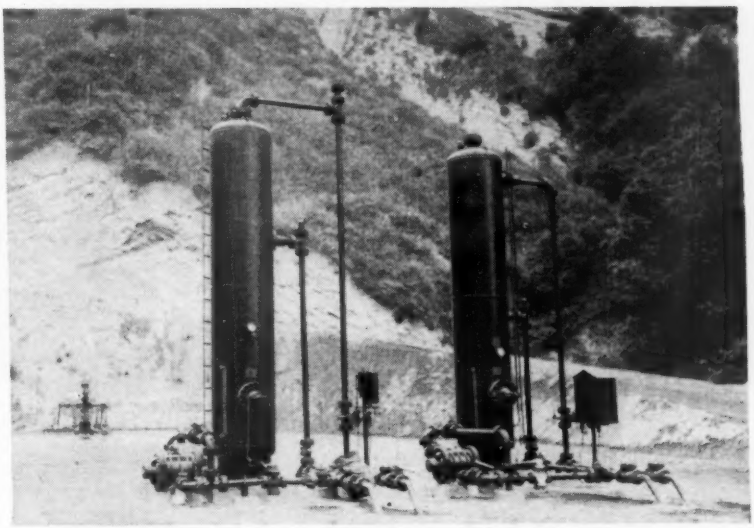

Fig. 7: For well testing, these separators are equipped with high-pressure displacement meters for the oil, orifice meters for the gas. Well at left is served by the left separator (second well not shown). Constituting the first of three stages of separation, further processing of oil and gas for all wells otherwise is done at a centralized point

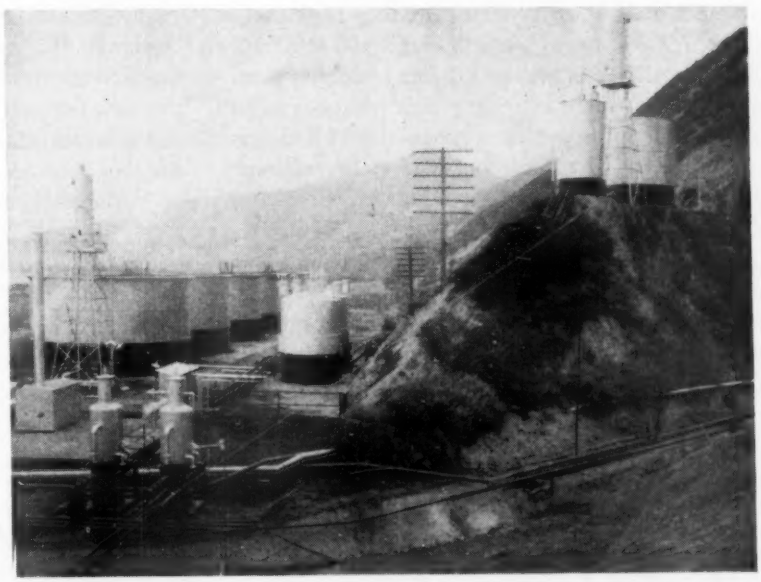

Fig. 8: Centralized oil and gas handling equipment adjacent to gasoline plant. Right to left: Wet oil section, with separator, gun barrel and receiving tank (all on hill) electrical dehydrators; second-stage, 430 to 40-psi., separators, two 3,750-bbl. working and six 5,000-bbl. storage tanks

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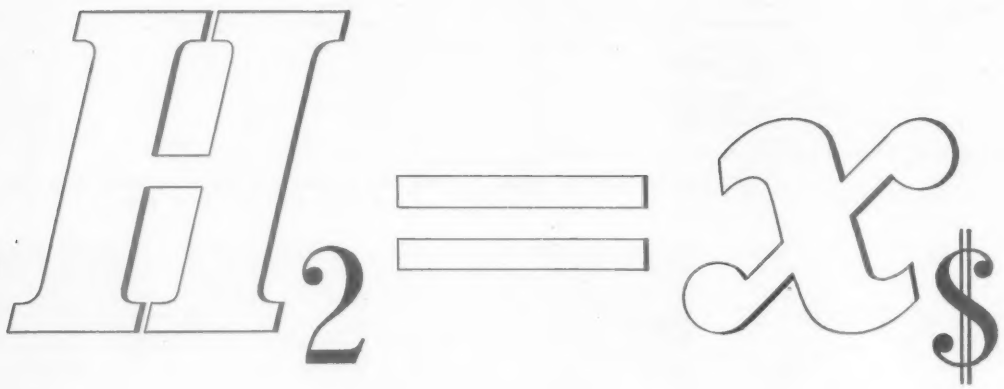

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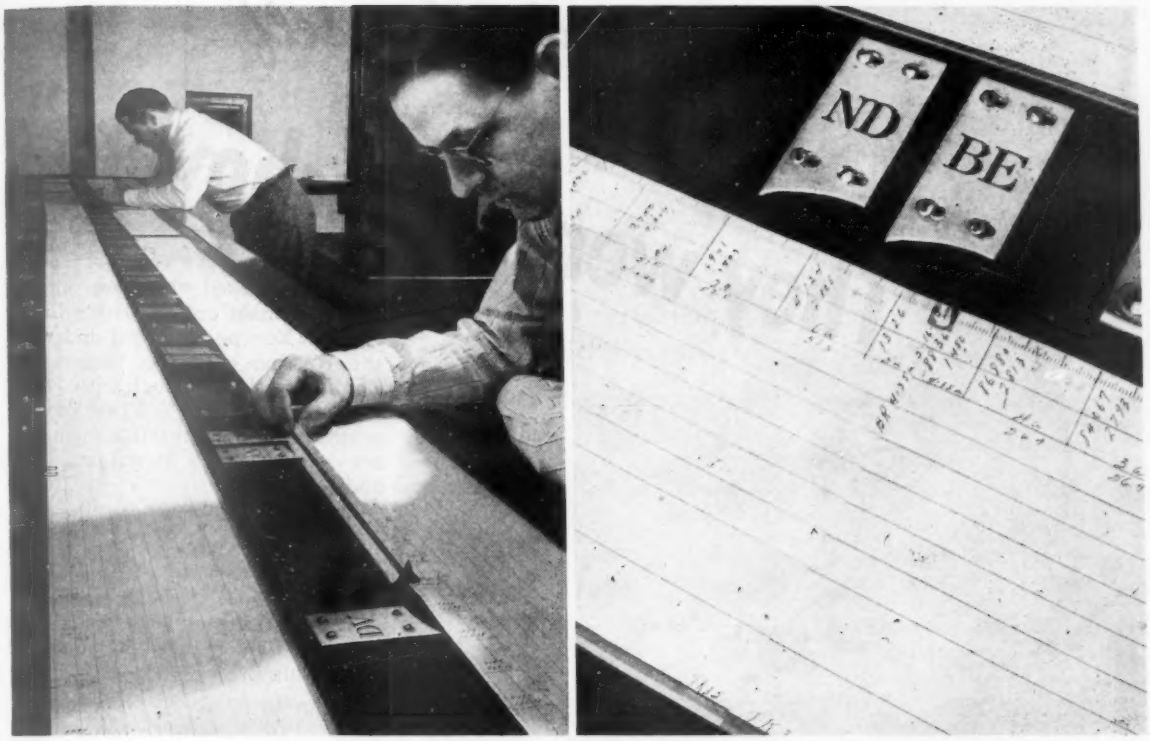


Left: E. A. Birge, chief dispatcher (right) calculating position of a tenderhead on graphic representation of pipe-line tenders laid out to scale on the dispatching board. Right: Detail of wide tape with color markings representing the product and shipper which is tied to the dispatching board. All calculations regarding time of arrival of tenders as well as other observations are made on the board. An exact hour-to-hour picture of the location of products in the line is given. "BE" represents a delivery terminal and "ND" an upstream pump station

Engineering and Operating Features of The Plantation Pipe-Line System

by Paul Reed

A previous article has introduced Plantation Pipe Line Co.'s system and explained its important part in the transportation of petroleum products from the Gulf Coast area to the eastern seaboard. It was published July 28.

PLANTATION PIPE LINE CO.'S pump stations have been architecturally designed to carry out the southern plantation "motif." All original stations have been constructed with impressive colonnade entrances, hanging lamps, and wrought iron grill work. Cream colored brick with cast stone trim has been used throughout. A feature of construction is the maintenance of air pressures on the control room and a vacuum on the pump room. This pressure differential, equivalent to a few inches of water pressure, insures that no hydrocarbon vapor can enter the control or switch-gear rooms. The pump rooms are equipped with heat absorbent glass windows in which screened-air intakes have been installed. The exhaust fans continuously pull fresh air through these intakes and this eliminates the possibility of an accumulation of inflammable hydrocarbon vapors.

Station manifolds are located outside of the pump rooms and are protected from the weather by steel canopy. At Baton Rouge, Helena and Bremen tank farms, all recognized safe operating practices for such installations are observed.

A steel roof covering the entire building and station manifold piping at all permanent stations furnishes protection against damage by lightning. This is made of 10-gage metal with sufficiently deep sections to bridge the 28-ft. span of the pump room without intermediate supports. This affords flat deck construction. The ceiling is enameled without additional plastering or covering. The roof is grounded at six points to a depth where resistance is not in excess of 2 ohms.

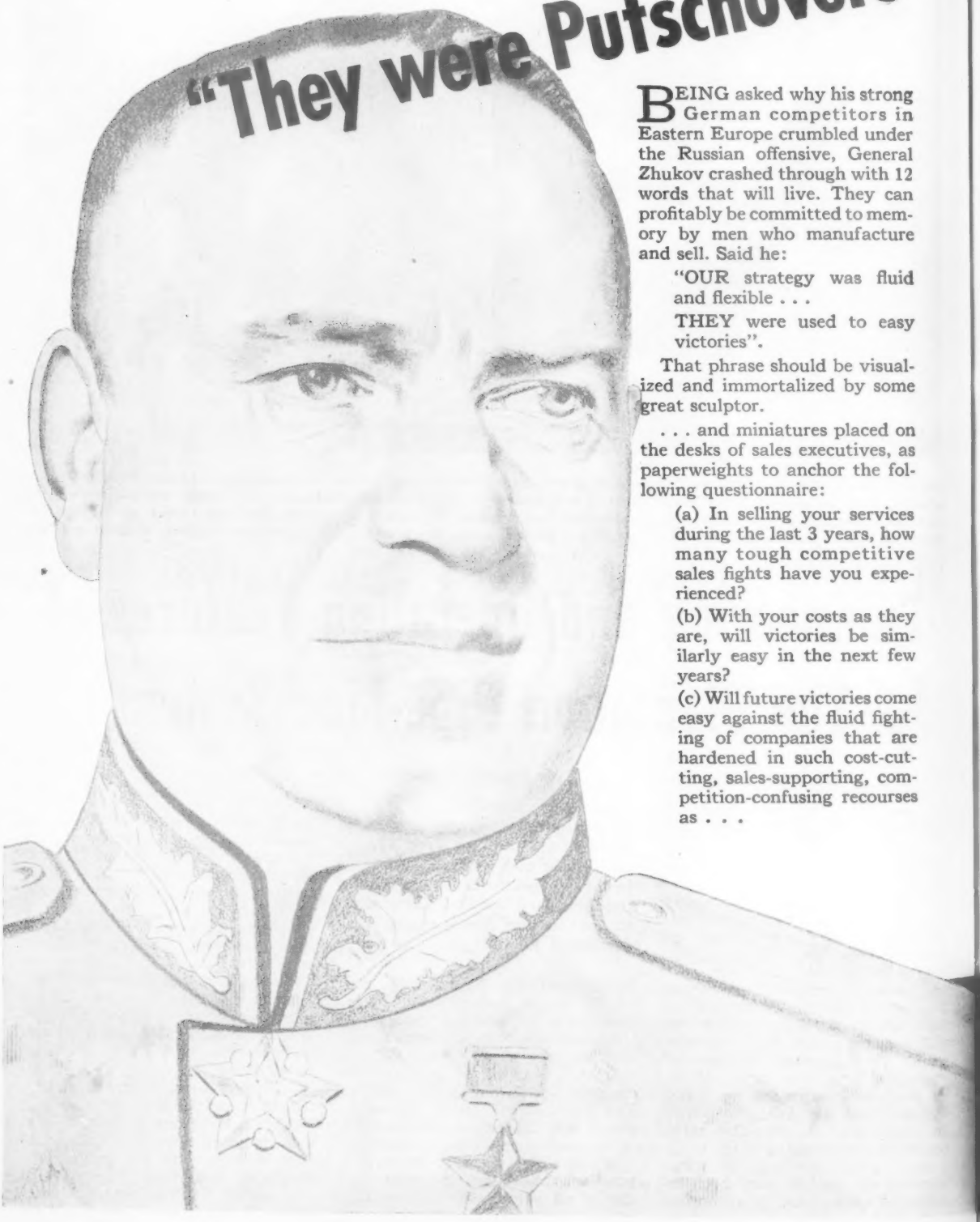
There has been no direct hit by lightning at any station; and this type of protection for personnel and equipment is regarded as completely adequate.

Lightning arresters and surge protective capacities are placed at substations and in control rooms to protect motors and other electrical equipment against line surges produced by lightning. The western end of the line traversing Mississippi, Alabama and Georgia is re-

XUM

then he said to himself

"They were Putschovers"



BEING asked why his strong German competitors in Eastern Europe crumbled under the Russian offensive, General Zhukov crashed through with 12 words that will live. They can profitably be committed to memory by men who manufacture and sell. Said he:

> "OUR strategy was fluid and flexible . . .
>
> THEY were used to easy victories".

That phrase should be visualized and immortalized by some great sculptor.

. . . and miniatures placed on the desks of sales executives, as paperweights to anchor the following questionnaire:

> (a) In selling your services during the last 3 years, how many tough competitive sales fights have you experienced?
>
> (b) With your costs as they are, will victories be similarly easy in the next few years?
>
> (c) Will future victories come easy against the fluid fighting of companies that are hardened in such cost-cutting, sales-supporting, competition-confusing recourses as . . .

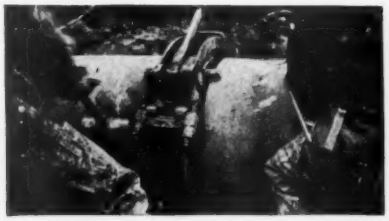
"Fluid and Flexible"... *he says*

THAT, ZHUKOV, is also the battle cry of oil country strategists using Arc Welding to win business victories. In pipe line construction, for example:

HOW THE FUEL FOR WAR GOT THERE *ON TIME*

During the past three years, 18,000 miles of pipe line (such as Big Inch) have been built in record schedules by this fluid and flexible method:

1 Contractor loads pipe onto truck, then strings it along right-of-way.



2 Line-up crew sets pipe sections on dollies and clamps ends of pipe.

3 Tack welders join clamped ends at several points in circumference.

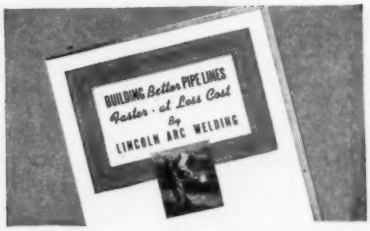
4 Firing line welders make welds downhand with pipe turning.*

5 "Hot dope" gang impregnates the pipe where soil is corrosive.

6 Tie-in gang heaves a strong, rigid 150′ section over to ditch.

7 Bell-hole welders complete the tie-in of sections.*

8 Down goes the line—arc welded to stay.



9 Complete procedures in Bul. 418. Ask for it on your letterhead.

**On many lines, this step is eliminated; all welding done at Step No. 3. This is the "stove-pipe" method.*

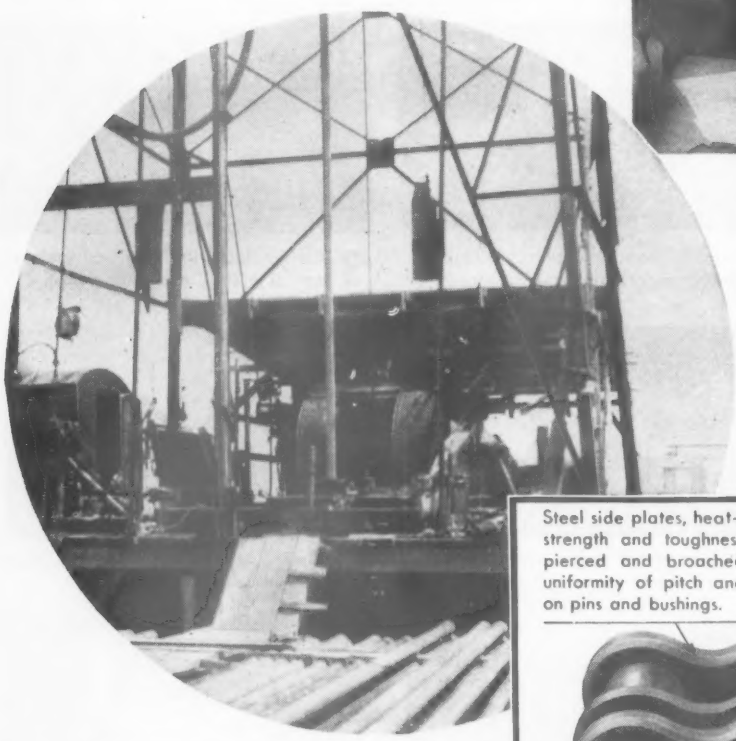
THE LINCOLN ELECTRIC COMPANY, DEPT. C-2 • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

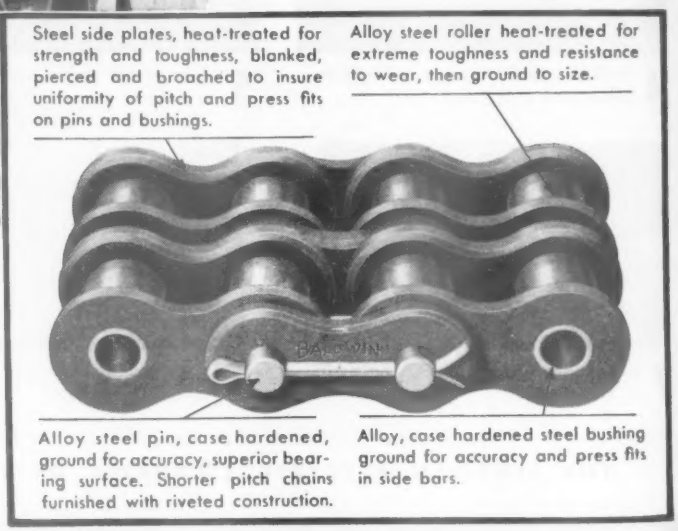
THEY FIT THE NEED FOR HIGHER SPEEDS

① BALDWIN-REX ROLLER CHAIN BELTS have the strength and stamina to handle the highest speeds . . . to stand up under the heavy shock loads of modern deep-well drilling.



② BALDWIN-REX roller chains help keep rigs going at top speed. The sudden starts and stops . . . the quick reversals have no effect on their performance. They get the bit down there fast . . . get it up again in a hurry. They absorb the shocks that might otherwise damage transmission units. No matter what the task, drilling rigs, pumping rigs, mechanical rigs, Baldwin-Rex roller chains keep the job moving . . . *fast.*

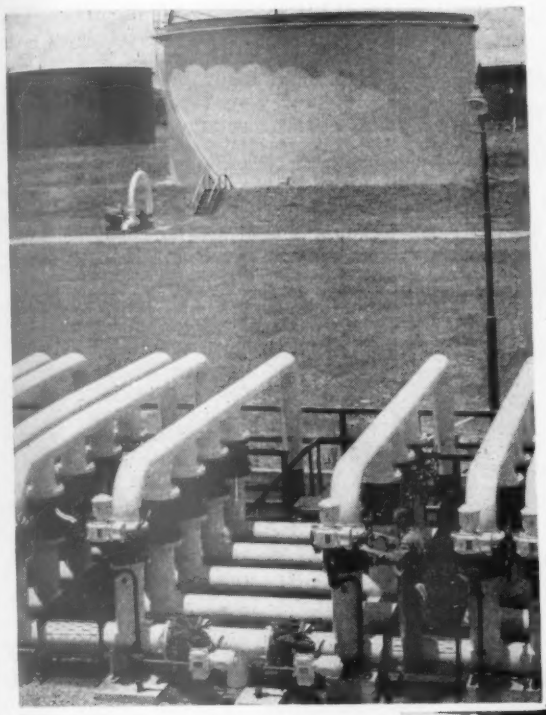
③ HIGH QUALITY CONSTRUCTION is the secret behind the superiority of Baldwin-Rex roller chain belts. Only the highest quality steels are used. Bearing areas are carefully heat-treated and finished. All machined parts are precision-finished to close tolerances and are assembled with heavy force-fits to assure long, dependable service.


Steel side plates, heat-treated for strength and toughness, blanked, pierced and broached to insure uniformity of pitch and press fits on pins and bushings.
Alloy steel roller heat-treated for extreme toughness and resistance to wear, then ground to size.
Alloy steel pin, case hardened, ground for accuracy, superior bearing surface. Shorter pitch chains furnished with riveted construction.
Alloy, case hardened steel bushing ground for accuracy and press fits in side bars.

You'll find Baldwin-Rex roller chain belts for sale in all oil fields. For information, ask your Baldwin-Rex Field Engineer, your local supply store, or write direct to **BALDWIN-DUCKWORTH** *Division of* **CHAIN BELT COMPANY,** *357 Plainfield Street, Springfield 2, Mass.*

BALDWIN-REX ROLLER CHAIN BELTS

Oil Field Offices: Houston and Dallas, Texas . . . Tulsa, Oklahoma . . . Los Angeles, California . . . New York, N. Y.



Baton Rouge terminal manifold with remote-controlled motor-operated valves on the front side. Other valves are hand-operated. In the rear is a typical electric-centrifugal pump with loop bypass of the kind installed to serve each tank

garded as one of the most troublesome in the country with regard to lightning.

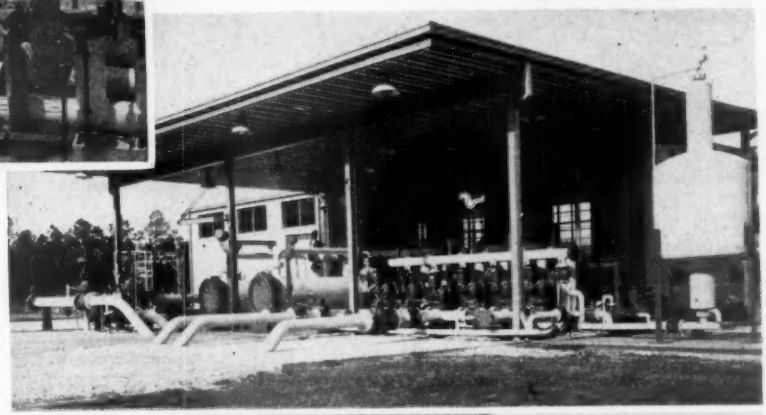
The Plantation system operates under so-called "tight line" or "balanced line" conditions. This means that the entire working system is under constant flow and continuous pressure during normal operations. No surge tanks are used at any time.

The Plantation system was the first to use a single pneumatic control valve for insuring that suction and discharge pressure be maintained within specified limits. This air-operated valve is allowed to close by the action of suction-discharge pressure controllers so that the station suction pressure is maintained above a minimum of 50 psi., and the outgoing line pressure below a maximum of approximately 900 psi. Instead of designing the line with the factor of safety of three, which is common practice, a factor of four was adopted.

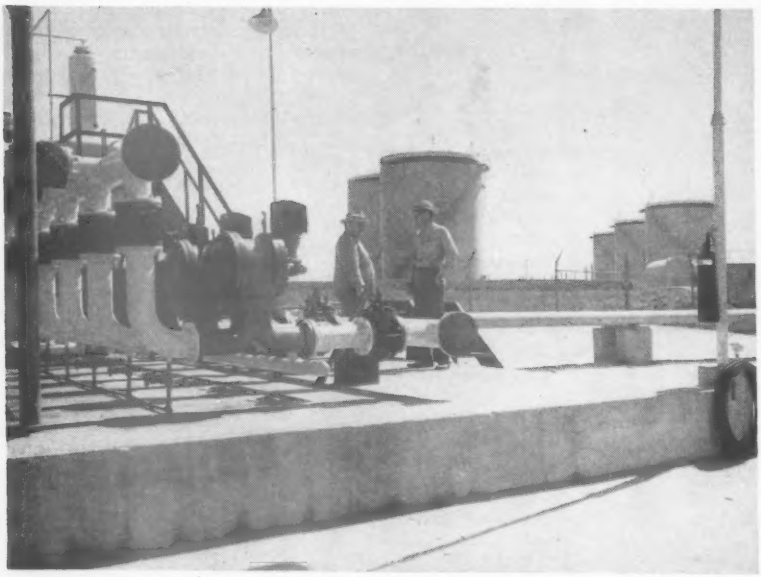
Each original station has a central control desk at the back of which a gage board is mounted. Pressure and flow recorders and indicating pressure gages necessary for station operation are located on the board.

On the control desk there are red indicating lights identifying the functioning of each of the protective shutdown and alarm switches. Amber and green lights indicate the open and closed positions of the motor-operated suction and discharge valves, and of the principal manually operated valves in the station piping. A schematic layout of the main piping for the station appears in a diagram on the control desk. In this diagram there are indicating lights, temperature indicators, ammeters, selector switches and pushbuttons in appropriate positions.

In accord with prevailing practices for modern electrical centrifugal pumping, the units of the Plantation system were designed for series pumping rather than parallel pumping. Pump motors were designed for efficient operation at either the daily rate of 60,000 bbl. or 90,000-100,000 bbl. For converting from the lower rate to the higher one, the only change necessary was the replacement of the cooling fan. The motors were built to operate at 95 per cent efficiency. In changing from the higher to the lower capacity, the loss in effi-



Top: Permanent pump station with manifold, scraper traps, and equipment for filtering and metering above ground. Bottom: Temporary intermediate station for war requirements built of wood. Control room is in a separate building back of the pump house. Connections are located in a pit because emergency construction conditions called for the utmost simplicity



Meters and tanks at delivery terminal

ciency would be only 0.8 per cent.

The pumps were also designed with sufficient flexibility for a wide range of throughputs. In changing to the higher pumping rate of 90,000-100,000 bbl. daily, it was only necessary to replace the impellers. Controls, piping, valves and filtering equipment were correspondingly designed for the capacity rates of 60,000 and 90,000 to 100,000 bbl.

With parallel pumping each of the two units would handle half the stream and put up all the pressure while with series pumping each pump takes all the flow and puts up half the pressure. In general, as the capacity goes up and the discharge pressure is reduced, the efficiency of a centrifugal pump is increased. Therefore, it is possible to obtain greater efficiency with a centrifugal pump in series operation. With pumps designed for parallel operation, the system would have a maximum efficiency of 75 per cent; with series pumping 85 per cent is obtained, representing a gain of 10 per cent. This results in a decrease in energy consumption and power costs for the system for any quantity pumped.

Pumping units are started by pushbutton control in the following sequence: (1) The suction valve of the pump is opened in 15 seconds; (2) the motor of the pump unit is started immediately thereafter; (3) the discharge valve starts to open when the motor is up to speed. The entire sequence, which takes 1 minute and 45 seconds altogether, is controlled automatically by a timing device.

The automatic switches have facilitated the safe operation of electric motors. In more than 3 years of operation no motor has been burned out by overloading. If the load approaches the maximum for which the motor was designed, an alarm is sounded and a red light tells the station operator so that he may know that he should immediately reduce the load 8 to 10 per cent, until motor windings are cooled. During the past year no motor has had a temperature at the critical point. Ammeters installed on the control desks are carefully watched in order that amperage on any unit does no exceed a specified maximum.

The control equipment provides for coordinated application of pressure, temperature and electrical control and indicating devices. An individual "start - stop" push - button controls each pump unit normally; the control system provides a predetermined sequence of operations. Controls serving the pumping units at an original station function to meet conditions outlined below:

A. Excessive duration of high-starting current.

B. High motor-winding temperature (alarm and light only).

C. High motor-bearing temperature (front or rear bearing).

D. High pump-bearing temperature (front or rear bearing).

E. High pump-gland temperature (front or rear gland).

F. High pump-casing temperature.

G. Low suction pressure—pumps 1 and 2.

H. High suction pressure—pumps 1 and 2.

I. High station - discharge pressure.

J. Low station-discharge pressure.

K. Low air - supply pressure to hydraulic controllers (alarm and light only).

L. Low station air-supply pressure (alarm and light only).

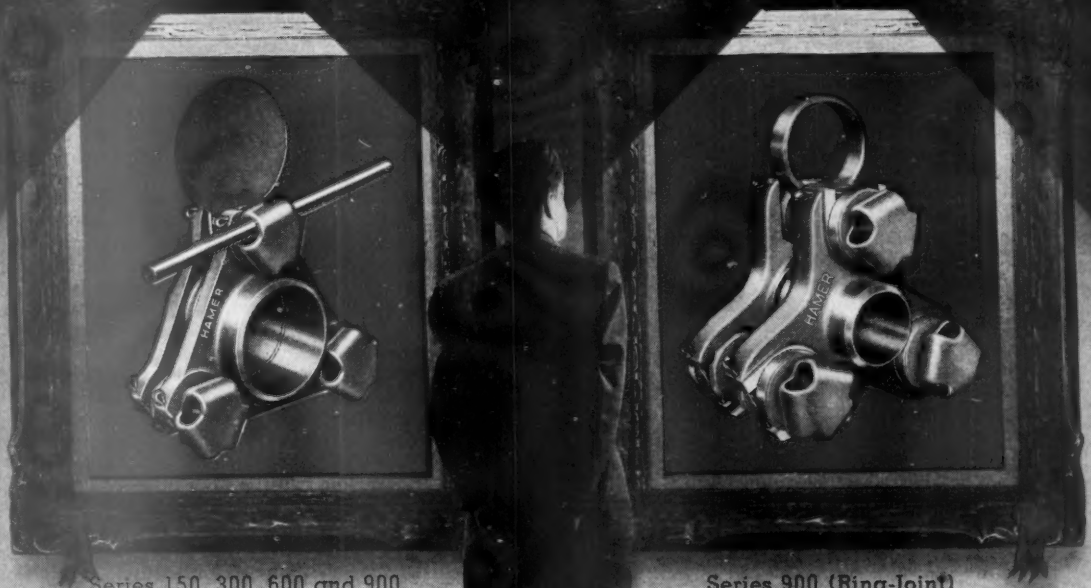
M. High sump-tank level (alarm and light only).

Each unit has a temperature indicator with a selector switch by means of which the indicator may be connected to motor bearing thermocouples or to motor winding thermocouples.

Pump operation has been improved at certain units by balancing shafts and impellers dynamically

Colonnade entrance, hanging lamps and wrought iron grill work of a typical pump station designed to carry out the southern plantation "motif"

For Distinguished Service in Saving Time and Money



Series 150, 300, 600 and 900
3-Bolt Line Blind

Series 900 (Ring-Joint)
3-Bolt Line Blind

The reports from users of these new 3-Bolt Line Blinds, testifying to the time they save, constitute a real blue ribbon award of merit. With either of these two Line Blinds, ONE MAN can close the line with a positive, leakproof shutoff, or turn it from closed to full-open, in ONE MINUTE — an important fact in these days of man-power shortages.

Union-Type Line Blind

Standard Line Blind

4-Bolt Line Blind

Geared Standard Line Blind

SEND FOR NEW HAMER LINE BLIND BULLETIN

HAMER
OIL TOOL COMPANY
2919 GARDENIA AVENUE
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and statically so, that by such balancing, whip has been eliminated from impeller assemblies.

Pump packing has been carefully studied. Service life of packing has been lengthened to 18 months, and it is expected that soon it will be extended to 2 years. The company is giving consideration to measures which may be developed by research to eliminate packing entirely in the future so that maintenance work and the chance for contamination would be reduced.

To standardize on motor installation, the company asked the manufacturer at the outset to use the same frame size for all motors. Consequently, the 900-hp. spare motor held at Bremen, Ga., for emergency service can be installed to replace either 900-hp. motors on the 12-in. line, 600-hp. motors on the 10-in. line, or 450-hp. motors on the DPC 8-in. extension. Therefore, one $10,000 motor saves the investment which otherwise would be put in three spare motors.

The spare motor has been used only twice. Both times it arrived by truck as soon as the other motor was removed. The motor is kept at the Bremen warehouse on skids at truck level and can be delivered 400 miles in either direction in 14 or 15 hours. The only complete spare installed pumping unit on the line is at Baton Rouge.

One of the important factors effecting the life and efficiency of pipe lines is corrosion. Internal corrosion, caused by the presence of dissolved oxygen in either the product pumped or inadvertently pumped water, lowers the "C" factor (increases internal friction along the pipe walls). The interior of the pipe becomes rough and the resistance to the flow of fluid through the pipe is greatly increased. Internal corrosion is effectively controlled on the Plantation system by the use of inhibitor. This material is added to the line in the form of an aqueous solution of caustic soda and sodium nitrate at each of the original stations. This is a patented process. Quantities of inhibitor used are specified in order to obtain the desired effect. The benefits have been of various kinds. Primarily, the purpose of the inhibitor has been to combat oxygen corrosion. In doing this a thin protective coating has been formed on the inside of the pipe. The great reduction in the formation of products of corrosion has increased hydraulic efficiency of the line, improved the effectiveness of measures for maintaining the sharpest possible demarcation between batches, lengthened the intervals between cleaning of hay tanks and filters, and improved the functioning of automatic controls.

External corrosion due to electrolysis, or to stray direct current flowing from the line, can be controlled by the application of reverse currents. Plantation now has a full-time engineer whose duties are to apply corrective measures to those sections of line where corrosion is taking place. Prevention of electrolysis largely eliminates pipeline leaks.

Metering facilities are provided wherever product enters or leaves the pipe line. All products are metered. Meter accuracy of better than 0.05 per cent has been obtained by carefully developed procedures and the solution of several research problems.

To protect meters and pumping equipment from excessive wear, all products are filtered through so-called hay tanks packed with special excelsior, and finally through felt-covered strainers. The filters remove all coarse pipe-line scale and suspended water, and also remove a considerable amount of finely divided suspended rouge.

Because of the effectiveness of the internal corrosion inhibitor, Plantation's lines are now comparatively free of rust and scale. This improvement is apparent from the considerable increase in "C" factors and from the small quantities of rust and rouge received from the line during normal operations, or when pipe-line scrapers are run.

Dispatching Department

The dispatching department, located at Atlanta, controls the movement of products throughout the entire system. Communication is by teletype so arranged that the dispatcher can selectively bell the operator at any station, or light a red flasher signal. By means of these signals, the operator can be summoned to the teletype machine from any location on the station property.

In the dispatchers' office, a graphic representation of the pipe line is laid out in scale, on a large table. This is called the "dispatching board". The distances between stations and take-off terminals on this board represents the capacity of the pipe line between the given points, on a scale of 1 in. = 2,000 bbl. As a product is pumped into the pipe line at the originating station, a 6-in. wide tape, with color markings representing the product and shipper, is fed into the graphic representation of the line on the dispatching board. When deliveries are made, the appropriate amount of tape, representing the product delivered, is folded under. The result is an exact hour to hour picture of the products in the line and their location. All calculations regarding the time of arrival of batches, and other operations, are made from the board.

This dispatching system makes it possible for the dispatcher to notify stations exactly (within minutes) when batch changes will arrive, and when changes in operation will be necessary. It is also easy to detect immediately any sizable error in calculations, bad metering, line leak, or other occurrence which might introduce a discrepancy into the line operations.

Posting of the dispatching board is relatively simple. Former crude oil pipe-line men in the Plantation organization have pointed out that such a system would be advantageous for dispatching some crude lines, because of its simplicity, the very small chance for errors, and the accuracy and speed with which complex operations can be worked out.

During the normal course of operations, it is not unusual for several take-off points to be receiving deliveries from the line at the same time, in one segment of line. This means that the stream may be flowing at several different rates along the line. Pumping and delivery schedules are planned, however, so that at no time will the flow rate fall below the point where the Reynolds number will be less than 15 per cent above the upper limits of the transition range from streamline to turbulent flow. Take-offs are made at certain definite rates, with full consideration to economical operation. Throttling of power and consequent waste of power is avoided by making the take-offs, usually, at a rate which will allow dropping one unit at all stations downstream of the take-off.

High line-load factors are achieved on Plantation by deferring deliveries at so-called "balance points", and making them when downstream stations are in trouble. Balance points are regular delivery terminals as close as possible to the originating station on each line. At these points, as soon as a given product reaches the station, line-up to tankage is made, so the product could be taken off on a moment's notice. If trouble is encountered a delivery can be made to offset the trouble; then, just before the product is by, the delivery is completed, and line-up is made for delivery of the succeeding product. Considerable advantage is gained by "stripping" at these balance points behind fuels and heavy products. When fuels are in the line, the line throughput is limited to the rate at which the fuel can be pumped. However, when the fuel has passed the balance point it is possible to bring the line-up stream of the balance point up to full speed on motor fuels and strip at the balance point the difference between the fuel rate and the motor-fuel rate.

While the writer was at the Baton

Rouge main line station recently, a switch was made from gasoline to tractor fuel. This normally occurs twice per month, but regular tank switching occurs several times per day.

On orders from the dispatching office at Atlanta, the Baton Rouge station operator at a specified time prepares to carry out the following sequence in operations. The gager having been previously warned of the impending switch had opened the tank valve on the tractor fuel tank so that tractor fuel could reach the tank farm manifold adjacent to the station. This leaves the manifold-tank line valve and the manifold-splitter valve closed. Both are plug-cock valves and provide double insurance against contaminating leakage.

1. At the specified time, the operator presses the starting switch which energizes the tank-farm booster-pump motor at the tractor-fuel tank. An ammeter shows the surge of current as the motor starts. In a few seconds, the ammeter indicates the power used in churning the tractor fuel against a closed discharge. This tells the operator that the booster pump is now operating and the line from the tractor fuel tank to the manifold valve is under pressure.

2. He then energizes the motor operating the manifold-block valve which admits tractor fuel to the manifold barrel. This takes 15 seconds to fully open.

3. He then pushes the switch energizing the manifold valve to the main-line pump suction.

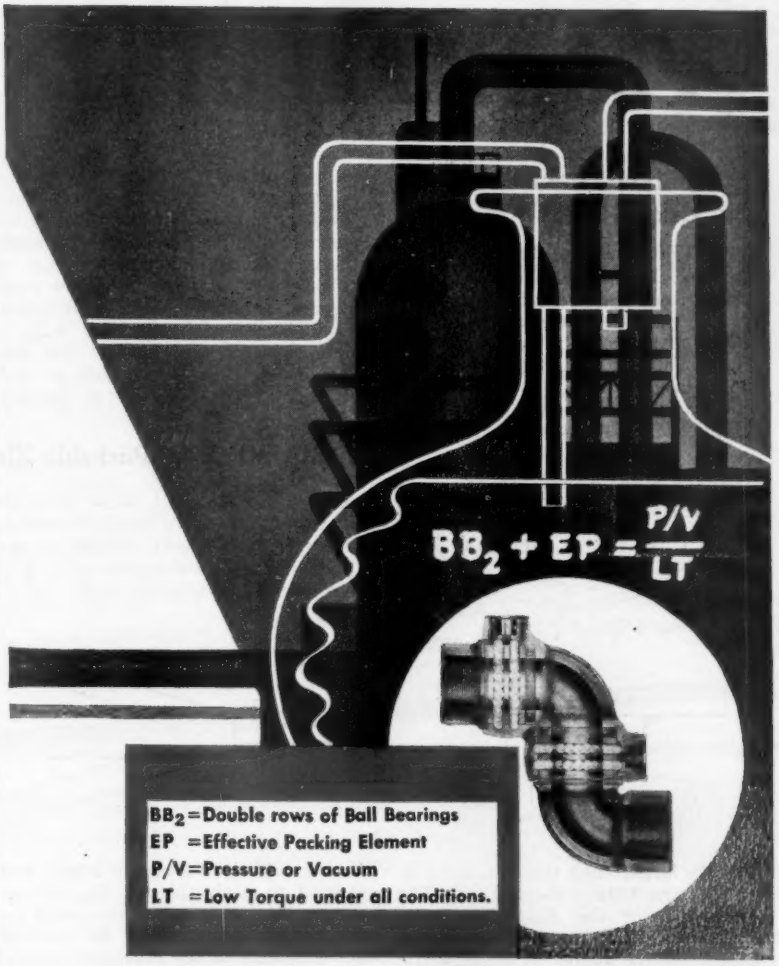
4. After 5 seconds, he pushes the switch to start the motor shutting the gasoline-manifold valve, thus stopping the flow of gasoline to the main-line pump suction. An overlap of 20 seconds occures in the opening of the one valve and closing of the other.

5. He then energizes the motorized gasoline-tank line valve to further close off the gasoline flow with a second block valve.

6. The final operation is shutting off the gasoline tank-farm booster pump and instructing the gager to shut the valve at the gasoline tank.

All the above operations were carried out at the tank-farm control board in the station. The operator has the regular station operating board in view all the time. Lights and ammeters give the operator visual evidence that his sequence of operations is being carried out satisfactorily.

For control of contamination, a helper takes 1-qt. samples at frequent intervals through each product switch since for several seconds both the gasoline and tractor-fuel lines are open to the main-line pump suction.


$BB_2 + EP = \frac{P/V}{LT}$
BB_2 = Double rows of Ball Bearings
EP = Effective Packing Element
P/V = Pressure or Vacuum
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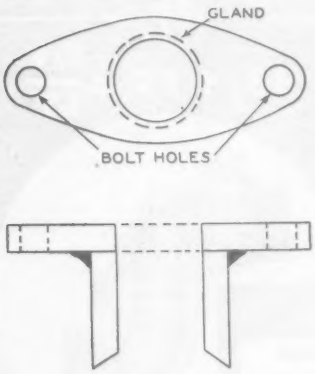
PLANT PRACTICES

Long-Lived Steel Packing Glands

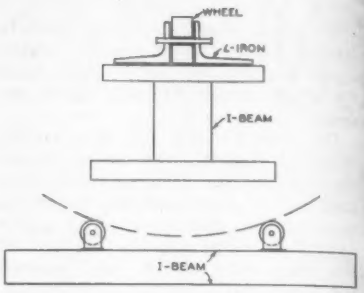
BETTER packing glands than the cast-iron variety may be made by cutting a section of ½-in. boiler plate of the desired size as the outside portion of the gland. In the center of the elliptical section a hole larger than the rod to be packed is cut. Into this hole a short nipple of the required size, just



slightly larger than the rod, is welded and the hole smoothed out. The other end of the nipple is inner beveled as shown in the drawing. Bolt holes are drilled in the opposite lobes of the plate, and the gland is complete. Such glands cost only a fraction of the price of the commercial product, may be made from scrap, and last many times as long as cast-iron glands, in most services.

Roller Support for Cylinders

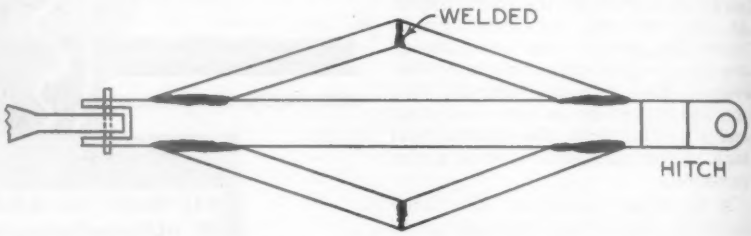
AS a simple support for cylindrical equipment such as drums, exchanger shells, etc., an I-beam is taken as base, of such size and strength as the heaviest job may require. At the desired intervals rollers are welded, or clamped if it is desired to change the spacing between rollers. These rollers are made by cutting from a sheet of ½-in. carbon steel a disk of the desired diameter, as 3 to 6 in., and drilling it at center for a shaft of, say, ½-in. rod. Two sections of angle iron of length less than the diameter of the roller are cut, with the vertical segment shaped into a smooth, paraboloidal type of curve as shown and drilled for the ½-in. shaft at a point above the horizontal base greater than the radius of the roller. The horizontal angles of these two angle supports are welded to the I-beam at ¾ in. apart—the shaft is passed through them with roller so supported. A pair of rollers so arranged and welded, or one welded and the other fixed to the I-beam base with a clamp, forms the support for one end of any type of cylinder, so that



the cylinder may be rotated easily for any work to be done on it, such as welding, etc.

Trailer Hitch for Portable Electric Welder Unit

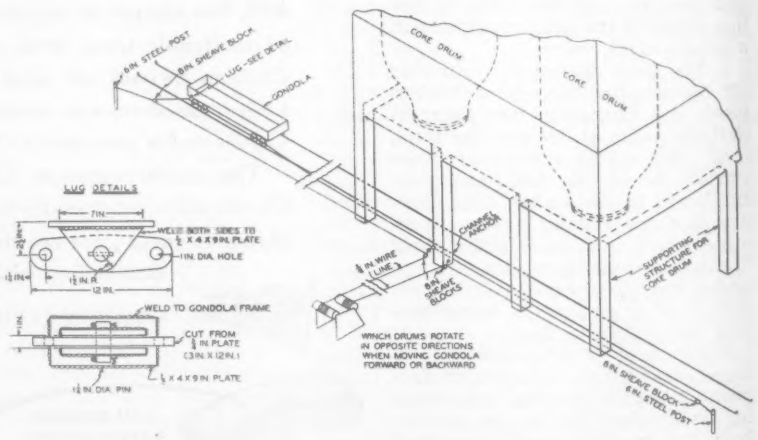
A 3-FT. section of angle iron or small I-beam is drilled through one end for a bolt which passes through each side of the iron and bolts it to the drawbar of the trailer of the welded unit. Angle braces are welded to each side of the bar as shown in the drawing, the bend in the center being made by cutting out segments of the horizontal angle of the brace iron, bending the vertical angle strip until the cut edges touch, then welding these in the desired angle; the ends may be bolted to the long bar if desired.



A hitch of any desired or available type is attached to the forward end of the bar by welding or by bolting, and the trail hitch is complete.

Winch Hookup for Moving Cars

THE arrangement shown in the drawing is used to move gondola cars to and from the area where cleanout coke is received from elevated drums. The winch used in the hookup is a standard commercial item, but it may be built in the plant's shop if desired. Attached by welding to the side still of the car the lug is plant-shop built.


8IN. STEEL POST
8IN. SHEAVE BLOCK
LUG - SEE DETAIL
GONDOLA
COKE DRUM
COKE DRUM
LUG DETAILS
7IN
WELD BOTH SIDES TO ½ X 4 X 9 IN. PLATE
1 IN. DIA. HOLE
12 IN.
WELD TO GONDOLA FRAME
CUT FROM ¾ IN. PLATE (3 IN. X 12 IN.)
½ X 4 X 9 IN. PLATE
1½ IN. DIA. PIN
CHANNEL ANCHOR
⅝ IN. WIRE ROPE LINE
8 IN. SHEAVE BLOCKS
SUPPORTING STRUCTURE FOR COKE DRUM
WINCH DRUMS ROTATE IN OPPOSITE DIRECTIONS WHEN MOVING GONDOLA FORWARD OR BACKWARD
8 IN. SHEAVE BLOCK
8 IN. STEEL POST

The ideas described on this page are used at the Toledo refinery of Standard Oil Co. of Ohio

Baash-Ross News

BAASH-ROSS TOOL COMPANY · LOS ANGELES · HOUSTON · NEW YORK

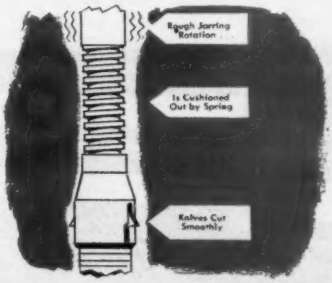
OUR 25th YEAR

These 3 Advantages are what give the BAASH-ROSS INTERNAL CUTTER that extra margin of Safety and Efficiency

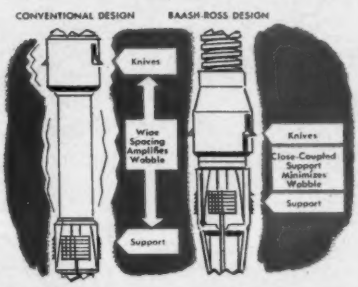
VIRTUALLY all pipe cutters work on the same basic principle—that of expanding knives against the surface of the pipe to be cut and then rotating these knives until the cut is completed. But the engineering refinements in this basic principle are what make the vital difference in pipe cutters, for such apparently small details as where the cutter support is located in relation to the knives and how the cutting force is applied can make a very substantial difference in the over-all operation and efficiency of the cutting tool.

For example, note these advantages engineered into the BAASH-ROSS INTERNAL PIPE CUTTER—and the reasons why they permit smoother, faster cuts and more economical cutting . . .

SMOOTH *CUSHIONED* FEED! In the *Baash-Ross Cutter*, weight is applied to the knives *through* this coil spring which cushions out the vibration and irregular feed of the rotating drill string. This is a great advancement over the conventional arrangement of applying the bare weight directly to the knives. It also eliminates need for any complicated accessory equipment to control weight. Baash-Ross cushioned feed means smoother, cleaner cuts and greatly minimizes breakage of knives even under rough handling!



RIGID NON-WOBBLE SUPPORT! Here's another important reason for the unusually fast clean cuts you get from a *Baash-Ross Internal Cutter*. Ever notice how a lathe tool cuts smoother when working close to the support? The Baash-Ross Cutter is engineered on this same principle, for the support slips are positioned unusually close to the knives. This practically eliminates all wobble, chatter and knife breakage, giving a much smoother, faster cut than possible where knives and support slips are widely separated as in conventional design.



MULTIPLE CUTS PER RUN! And here's a vital Baash-Ross feature that means both speedier and more economical cuts. With the Baash-Ross Internal Cutter you can make successive cuts on *one* trip without removing the tool for resetting. This feature is particularly valuable when you are not sure where the pipe is stuck. Simply start at either the top or bottom and make successive cuts as desired. Cut sections can later be recovered with a spear or socket. Saves time, simplifies operations, cuts costs!

CUTS TUBING, DRILL PIPE, LINERS, CASING!

No matter what your inside cutting job, there's a size and type Baash-Ross Internal Cutter to handle it. Even a type for Internal Upset pipe. Your nearby Baash-Ross representative will be glad to give full details . . . or write direct. Also see pages 290-291 of your Composite Catalog!

(Leased in U.S.A.—Sold for export only)

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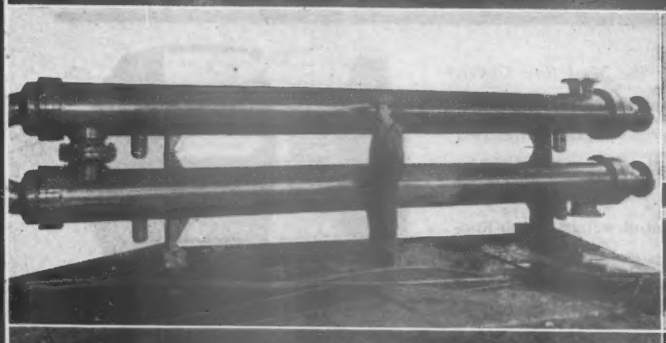
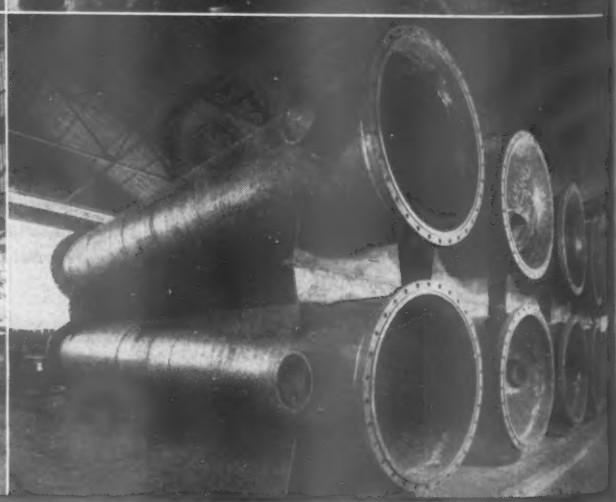
heat exchangers, reboilers, jacket water coolers, condensers, shell and tube, atmospheric and submerged types. Among important installations are 100 octane gasoline and synthetic rubber plants.

EFCO





ENGINEERS & FABRICATORS, INC.

P. O. BOX 7395 EFCO HOUSTON, TEXAS

MODERN *Rotary Drilling Machinery* AND PRACTICES

Part 6—Drilling Practices

by W. S. Crake

THE operator's ultimate aim in assembling any drilling rig is to be able to drill wells with the maximum speed and with the lowest cost and hazard. Once a given rig, drill-pipe string and hole size have been selected for a job, it becomes the task of the operating crews to make the hole with the minimum number of bits and in the shortest possible time consistent with safety. While the original design of the rig fixes drilling efficiency to a major extent, the final results are largely determined by the intelligence and knowledge of the driller and the skill of his crew. It is the driller alone who is continually on the job to study rig performance and behavior of the bits in the well. While the tool pusher and engineers can advise the driller on general terms, facts and figures, and give suggestions, the ultimate choice of proper rotary speeds, weights, bit types, and pumping rates are, as they should be, under the direct control of the driller with the advice of the tool pusher being available on call.

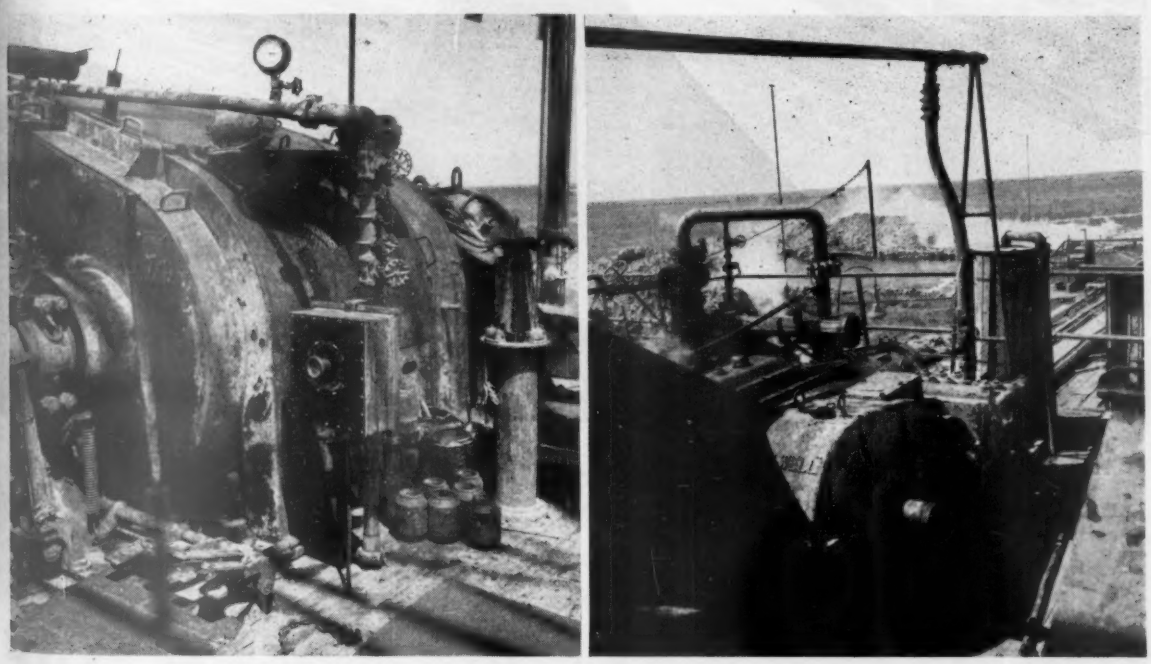
Drilling Efficiency

Actually, the only productive hours are those spent "on bottom" making hole. Since coring is a necessary exploratory procedure, and in many cases requires subsequent reaming of the cored section, all time spent coring and reaming should be charged against the drilling time when calculating drilling efficiencies.

The following formula is suggested for determining the drilling efficiency, the over-all drilling time being considered as the total time the rig is on the well, including rigging up, tearing down and cementing time:

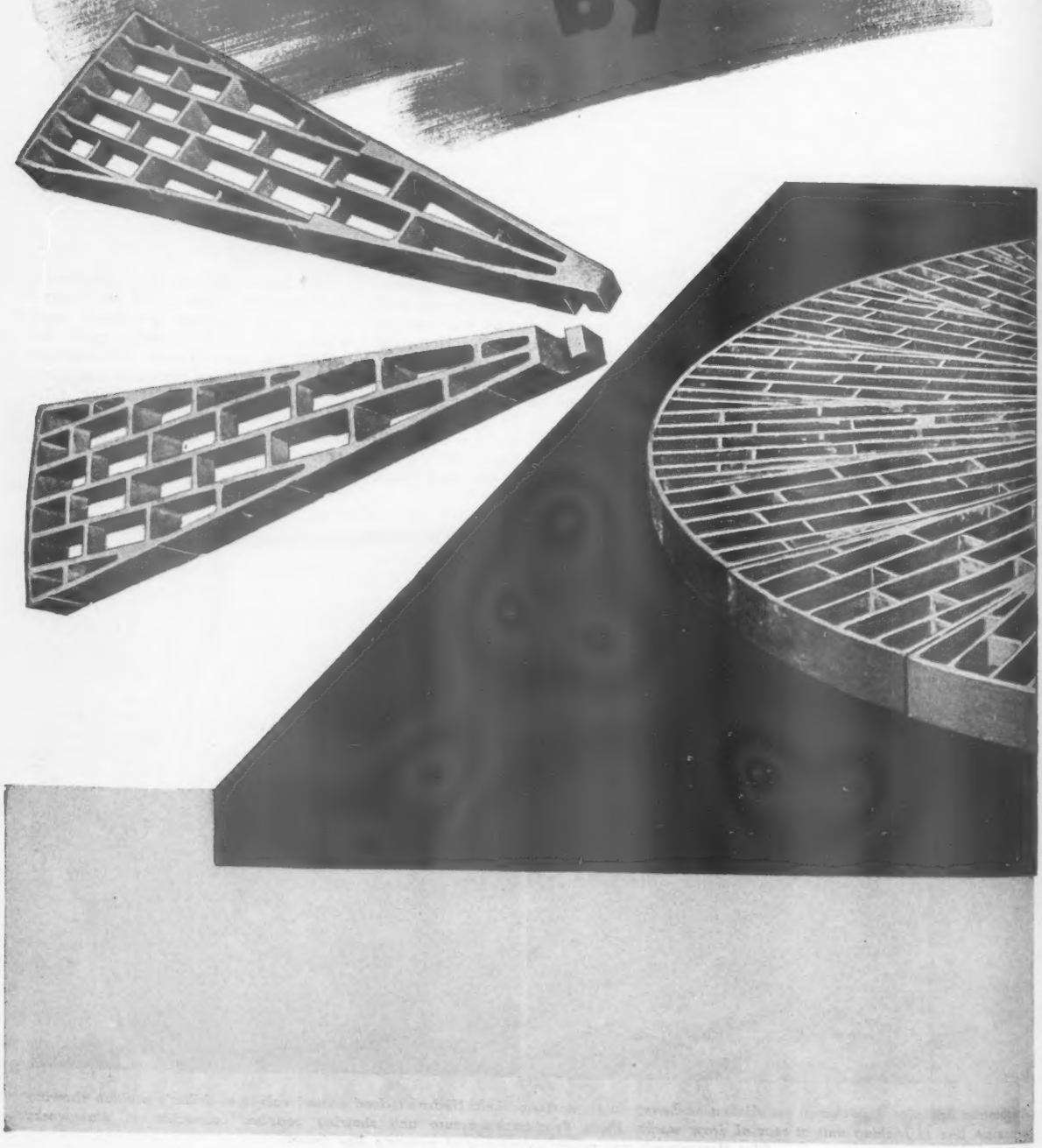
$$\text{Drilling efficiency} = \frac{\text{Hours on bottom drilling, coring, reaming}}{\text{Total hours over-all drilling time}}$$

The figure obtained is a measure of productive time and will vary with each drilling territory and depth. In shallow wells, such as drilled in East Texas, efficiencies of 65 per cent are common. On deep wells in hard drilling territory, efficiencies of 40 to 50 per cent are typical and on typical Gulf Coast wells 50 to 60 per cent may be expected.



Automatic drill-pipe feed-control installation on heavy-duty steam rig. Left: Hydraulic feed control valves at driller's position showing pressure line to braking unit at rear of draw works. Right: Feed-back-pressure unit showing gear-box connection to draw-works drive (foreground) and water chamber and pressure line (rear)

a GRATE job... by B&W



In size, weight, close tolerances and delivery, these intricate 7-ft., 575-lb. grating castings are a good indication of B&W's ability to produce alloy castings for the process industries to unusual requirements.

The order called for 200 sections—comprising ten circular units like the one shown. Tolerance of +0¼ in. on straightness was specified—*and B&W not only met this specification, but on 90% of the sections actually exceeded the accuracy required by ⅛ in.*

Tolerance on length was +⅛ in., and +0-1/16 in. on depth of grooves in sides. B&W *met all these close tolerances, too. Casting, machining, and shipping this unusual job were completed within seven weeks.* Material used was B&W Alloy 661, 25% Cr., 12% Ni.

These grating castings join many other complicated designs in demonstrating that no fabricating job is too difficult for B&W when it comes to building process equipment for high temperature services. That's because designing and building pressure vessels, drums, tanks, towers, tubes, piping and related products is a major activity at B&W—
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When you're drilling *electrically*, equipment can be "dispersed" to fit the lay of the land. You don't have to do a lot of excavating. Nor do you have to spend time and money building foundations to keep heavy engines, mechanical gearing, and the drilling rig in line. With only electric cable needed to connect the power source with the motor drives, rigging-up and tearing-down time is materially less—whether the site is hilly or flat.

Under all drilling conditions—

The motor torque and speed characteristics inherent in G-E drilling rig drive are excellently suited to this service. They are easier on drill pipe because they provide a cushioning effect that reduces twist-offs.

With properly engineered d-c drives, moreover, you get finger-tip control that is both accurate and flexible. Time is saved on difficult fishing operations. You also increase the percentage of time the bit is on bottom.

G-E rotary-rig drives, which include specially designed armored motors with steel frames and oversize shafts and bearings, have made an excellent record in cutting the cost of deep drilling. Ask our nearest office for complete information on the latest developments in electrified drilling. *General Electric Company, Schenectady 5, N. Y.*

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Drilling efficiency is not a function of the cost of drilling but is mainly a measure of the effective usage of the machinery and manpower involved. This is seen by the fact that high drilling efficiencies in hard-formation territory still involve low average penetration rates whereas in soft-drilling territory, the same efficiency may be obtained and much lower drilling cost result because of high penetration rates. Along with the drilling efficiency, the average penetration rate should be studied. Low drilling cost is associated with high efficiency and high penetration rates.

Breakdown of the over-all drilling time into the following headings is useful for analyzing drilling operations.

(a) Rigging-up and tearing-down time.
(b) Drilling time on bottom.
(c) Round trip time (drilling).
(d) Coring and reaming.
(e) Round trip time (coring and reaming).
(f) Testing, logging.
(g) Running casing and cementing.
(h) Repairing and completing (squeezing, plug back, production testing, etc.).
(i) Miscellaneous.

Calculation of these groups of operations as percentages of the over-all drilling time gives the operator a sound basis from which to investigate and improve the most time-consuming items. Other breakdowns and classifications may be made, depending upon the individual operator's requirements. Wildcat wells will have lower drilling efficiencies than development wells due to the high proportion of time usually spent on items (f) and (h) above.

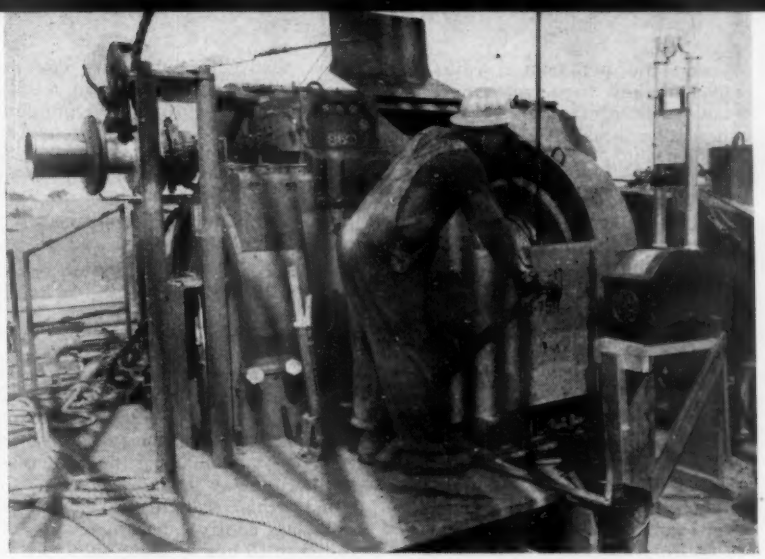
Drilling Variables

While making hole with any given bit in a given formation, there are four main variables which affect the bit performance. These are as follows:

1. Characteristics of the drilling mud.
2. Volume of circulation.
3. Rotary, r.p.m.
4. Weight on the bit.

The above list assumes that the important variable of having the best possible type of bit in the hole for the formation being drilled has been solved and that only the best quality of materials and knowledge have been built into the bit. Drill-pipe torque, which is a secondary variable induced by a combination of the last two listed variables and wall friction caused by crooked holes, is left out of this discussion.

When considering the above main variables, it is seen that there can be a very large number of reasonable combinations thereof applied against the bit. This is true because any significant change of one of the variables requires compensatory change of one or more of the others. In addition, formations in the earth are extremely changeable in drillable characteristics within short intervals of depth.



Geolograph recorder installation (right) for charting drilling time and bit penetration

Fortunately for operators, manufacturers of bits, particularly the more expensive hard-formation bits, make broad recommendations as to circulating values, weights and revolutions per minute most suitable for their products under ordinary conditions. These recommendations are usually based on the soundest of platforms, which is long-term experience, and operators who neglect this advice are generally inviting poor bit performance and high drilling costs.

In examining the drilling variables in detail, one finds the following:

1. Characteristics of drilling mud. From the standpoint of bit performance alone, it is generally true that clear water gives the best bit performance because its low viscosity interferes least with the cleaning and cooling of the bit blades, and its solution capacity, or ability to mix with cuttings, is high.

Unfortunately, however, other requirements of the hole seldom permit the use of water as a circulating fluid, since it cannot suspend cuttings, has no sealing capacity in porous formations, and causes cuttings to have high clippage rates in the annulus. This requires higher annular velocities to give the same cutting-removal rates.

The drilling fluid qualities are, as a general rule, beyond the control of the driller and are set by the mud engineer to suit the well requirements and not those of the bit. Wherever possible, without endangering well safety, the mud engineer should bear in mind the mud qualities needed for best drilling performance. Drillers, in turn, should attempt to keep the drilling mud in the condition required by the mud engineer in order to obtain the best performance from the bit, consistent with well safety.

2. Volume of circulation.—This is a vital factor in obtaining good bit performance. If the volume is kept within the range recommended by the bit manufacturer, the bit performance should be good. If the volume falls below the recommended rate, bit performance can be expected to fall off. The amount of falling off of performance is very difficult to trace, since it can either be in penetration rate or in bit life and is often accepted by the operator with the blame placed on the bits. This variable is closely related both to rotary r.p.m. and bit weight, especially in soft formations, because the circulating volume required is closely dependent on the volume of hole excavated per minute and the ability of the circulation to clear the excavated cuttings away from the bit. With a fixed circulating volume, an excessive excavation rate will cause reduced bit life because of poor blade cooling.

3. Rotary r.p.m. — This variable, neglecting its effect on the drill pipe and rig, which is another problem, is again dependent on bit type and experience. Exponents of high and low r.p.m. both have their reasons, some good and some bad, and both have had success and failure. The bit design and formations being drilled are the keys to the correct range of operating speeds to use.

Rotary r.p.m. depends on the weight being carried and the rate of circulation. There is no point in removing material faster than it can be thrown clear of the cutting edges. For a fixed rotary r.p.m. and circulating volume the weight on the

bit and the penetration rates become the key to performance; excessive weight often gives excessive penetration rates which causes blade clogging and burning of cutting edges.

4. Weight on bit.—With fishtail bits this is dependent upon the sharpness of the bit. It can be seen that a "sharp" bit requires less weight to keep the cutting edge buried in the formation than a "dull" bit. If a sharp bit is given the same weight as a dull bit, the sharp edge is buried too deep in the formation, cannot be cooled properly, and will burn off very rapidly. When run into the well, fishtail bits are often sharp enough to use as an axe but it is certain that, with the rough control and heavy weight applied to bits, the sharp edge is worn off within the first few minutes of drilling. On known occasions when "green" bits have been pulled after a few minutes operation, the cutting edges had been burned off to a flat of about 1/32 to 1/16 in. wide, even in relatively soft formation. Proof of burning, rather than wear, is the appearance of "green" pulled fishtail bits which, if proper circulation rates have been used, are usually not badly worn on that portion of the blade directly in the path of the circulating jets. This is the part of the blade which obtains maximum cooling effect at the cutting edge and, therefore, the least wear or burning.

On rock bits the best bit weight to use is generally quite closely determined by the manufacturer on laboratory tests on rock samples of the same kind. The weight must be sufficient to force the teeth against the formation and crush or shatter the rock in the manner for which the bit teeth are designed. The best r.p.m. also is that which gives the teeth sufficient time to perform their function as they pass over their cutting position. High-speed rotation acts to reduce proper bit action in a way similar to the action of an automobile running over a "washboard" road. At low speed, heavy vibration occurs and at high speed, the vibration disappears. The rock bit needs the "cable-tool effect" of vibration for its best results.

Automatic Drilling Controls

The author is firmly of the opinion that the drilling variable which is most difficult to control, and the mastering of which undoubtedly holds the key to large increases in bit life, is the control of the weight on the bit. This applies to the choice of the proper amount of weight, and to the application of this weight in as constant a manner as possible, to the bit.

It is not difficult to imagine, or for any machine-tool operator to know positively, what life can be expected of cutting tools in a machine shop if continually changing rates of hand feeding are used. Admittedly, it is possible for an expert machinist to perform good work by hand feed, but the job is slowed down, its quality often lowered, and the mental and physical capacity of the operator severely strained thereby.

The machinist's task is easy compared to that of the driller, since the former has positive, and visible, fine hand control of his work and rigid mounting between tool and work. The driller, using a brake of construction and capacity enough to stop, perhaps, 7,000 or more horsepower runaway loads, is expected to adjust this roughly constructed brake to control drilling loads of from 5 to 20 hp., or from one-twelfth to one-third of 1 per cent of the brake capacity. This is actually a fantastic requirement, and the result is that the line is "fed off," on the very best of rigs, in jerky fashion as the brake drums pass over high spots, rough spots, "slick" spots and heat cracks caused by heavy brake drum wear resulting from "going in the hole."

Since the driller's cutting tool is suspended on a highly elastic string of pipe, often 1 to 2 miles below, the uneven feeding induces torque changes and vertical vibrations in the drilling string which cause considerable variations in the weight on the bit.

On fishtail bits, the tremendous improvement in the use of hard metal on bits and in blade construction and materials in the past 10 years, has given up to a tenfold improvement in bit life, with consequent drilling-cost reduction. This particular improvement of the bit itself is probably reaching a saturation point and new lines of approach are needed to give increased life. One of the lines of approach suggested is automatic feed control, and another is stabilization of the bits, either by their own design, shape or by use of auxiliary stabilizers. Both of these principles will work towards smoothing out bit action, reducing impact on cutting edges and approaching machine-tool action.

The writer is as fully aware as any one that the driller's impossible physical task of feeding bits evenly results in "approximate feeding" on soft drilling. On slow drilling, with rock bits, "intermittent feeding" is used in which the weight is added up to a certain limit, often over the bit capacity, and then allowed to "drill off" to some lighter load. This loading is destructive to bits. When overloaded, bit-bearing life is destroyed and, when underloaded, the tooth life is wasted. The results of constant-weight feeding can be highly significant if properly applied, especially on deeper wells where the requirement of more footage per bit becomes a crying need.

The author, therefore, suggests that operators would do well to experiment thoroughly with automatic feeding and that manufacturers should construct all hoists in such a way that automatic-feeding devices can be installed by the operator, without their becoming awkward appendages or requiring "special" hoist shafting to provide a convenient place to connect the controls.

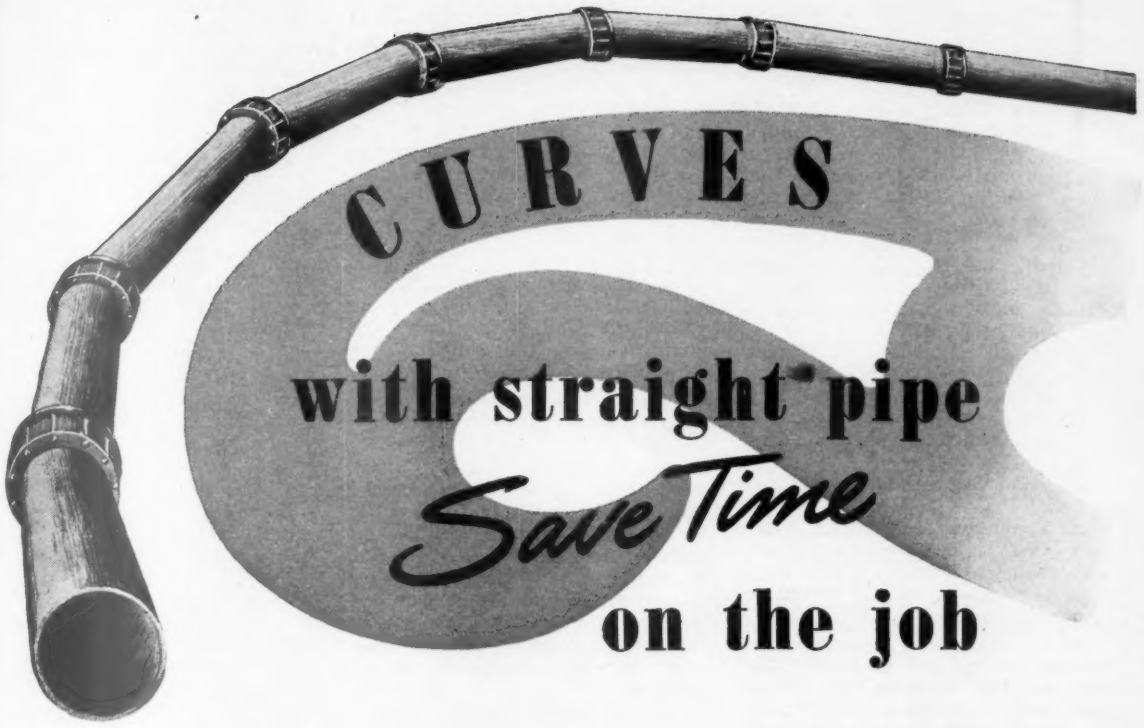
With regard to the type of automatic control, it is not certain at this time exactly what the most suitable type will be. In a homogeneous formation, a constant rate of feed of the kelly will maintain a weight on the bit which will gradually increase as the bit becomes dull. Whether feed rate could ever be controlled in true proportion to bit sharpness is doubtful and in any case truly homogeneous formations are scarcely ever encountered for any reasonable footage.

The writer considers that a control which is capable of keeping a constant weight on the bit, and by which this weight can be varied simply by the driller, will be necessary. To avoid such a control permitting the pipe to lower into the well too fast when the bit passes through a cavity or "soft spot," a superimposed speed governor or control is necessary. This supplemental control should again be capable of being set by the driller so as to permit him to control the maximum dropping rate of the pipe when the weight on the bit disappears.

Several drilling controls are on the market and the operator needs to consider the type carefully to be sure it is designed to answer his requirements. The true value of a drilling control is often difficult to calculate, since this device calls for a new approach to drilling operations and permits the driller to experiment with his drilling variables, with the most important one—the weight on the bit—under good control for the first time.

The author, therefore, does not wish to suggest that automatic control will prove an instant success. It can, however, relieve the driller of physical exertion and can leave him free to think and direct his experience and talents towards obtaining higher drilling efficiencies.

In connection with automatic control, it should be remembered that, due to elasticity of pipe, vibration, wall friction, and other factors, instantaneous load on the bit is not truly reflected on a surface-weight indicator. Steady rotary r.p.m., pump output, and smooth feeding, however, tend to iron out vertical vibrations



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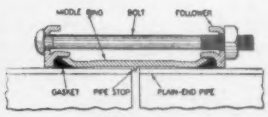

Cross Section

Dresser Couplings are simply installed . . . and easily salvaged for new lines. Two resilient gaskets held in compression, grip pipe tightly . . . but also permit considerable latitude in pipe deflection to permit building curved pipelines. This flexibility also permits expansion and contraction of pipe sections without setting up harmful stresses . . . the key to the decades of service with practically no maintenance so characteristic of Dresser-coupled pipelines.

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of the drilling string which affect the bit.

Instrumentation and Records

Modern drilling requires that the driller be furnished with a number of essential instruments, in order to perform his work efficiently, and these instruments must be reliable and accurate to be of any real service.

On all rigs, the following readings are of important use to the driller and enable him to check operating performance:

(a) Weight indicator.
(b) Mud-pump pressure.
(c) Mud-pump r.p.m.
(d) Rotary r.p.m.
(e) Steam pressure on main line (steam rigs).
(f) Vacuum gages on all engines (power rigs).
(g) Torque on rotary (steam manifold pressure on steam rigs or rotary engine vacuum on power rigs).
(h) Pressure on blowout-preventer operating lines.

Other desirable records are: Weight of mud emerging from the well, and also entering the well; a gage on the mud pit to show when gaining or losing mud; rate of feed of kelly; air reservoir pressure; air clutch operating pressures, depending on the type of rig used.

On modern heavy rigs all the instruments needed should be mounted on one instrument panel, properly vibration proofed, so that the driller can see all his instruments as needed. Permanent charts of drilling weight, penetration rate, and mud weights should be obtainable as needed. The first two records are used for rig-performance studies, and all three records can furnish valuable well information.

The driller's log, or special mechanical report, should record all rig-performance information desired by the operator, especially if special drilling studies are desired. Drilling-progress charts, showing the depth of the well against a time scale of days, are useful for comparing drilling times in a particular field, especially where large development programs are involved. Cost data, subdivided to suit the operator, are also helpful in these studies. On a new type of rig, or where new features have been added to old rigs, drilling-progress charts in similar formations indicate the results obtained from the improvements made.

Control of Drill-Pipe Wear

The problem of obtaining longest life from a string of drill pipe is one of extreme importance to the operator, since drill pipe is one of the main consumable items on a rig.

A program of education of the drilling crews on the subject of proper use and care of drill pipe is an essential part of drilling economy. Records of footage drilled, checking of wear, culling of bad joints, and repair of damaged or worn pipe, all pay good dividends in safety and economy to the operator. Many methods of drill-pipe repair and checking are used but these are complex and are a subject in itself.

Tool-joint wear is proportional to the horizontal pressure of the joint against the wall of the hole, the rubbing velocity, the time run and the abrasive quality of the mud.

Tool-joint wear has been attacked, with varying results, by three main methods:

1. Replacement of joints, or worn metal, including use of hardened joints, of hard metal, and wear subs.
2. Spreading the wear by use of external flush-joint pipe or joints approaching external flush-joint pipe, such as double streamline joints.
3. Use of rubber protectors—mainly in casing but continues in open hole.

Local conditions usually determine the most suitable method of solving this problem except that drilling of "straight hole" is always the most desirable method of reducing wear because it reduces the horizontal pressure of the joint against the wall of the well and this reduces the fundamental cause of wear. Removal of crooked joints which cause vibrations in the string is also a wear saver.

At the lower end of the drilling string, the use of a sufficient number of drill collars to keep the drill pipe in tension above the drill collars is an essential good-drilling practice. This practice reduces the wear of drill pipe and also reduces kinking and twistoff failures in the pipe directly above the drill collars. This is especially true in soft formations, where the hole may be washed out to large diameter close above the bit, and compressive loading of drill pipe in these washed-out sections can cause major drill-pipe kinking and failure troubles. Wear caused by using too few drill collars is characterized by taking place mainly in the center of drill-pipe joints, which are most flexible at this point, and by barrel-shaped wear of tool joints. Twistoffs are frequent in drill-pipe damaged by this type of bad-drilling practice which combines poor economy and poor engineering.

Choice of Bits—Bit Costs

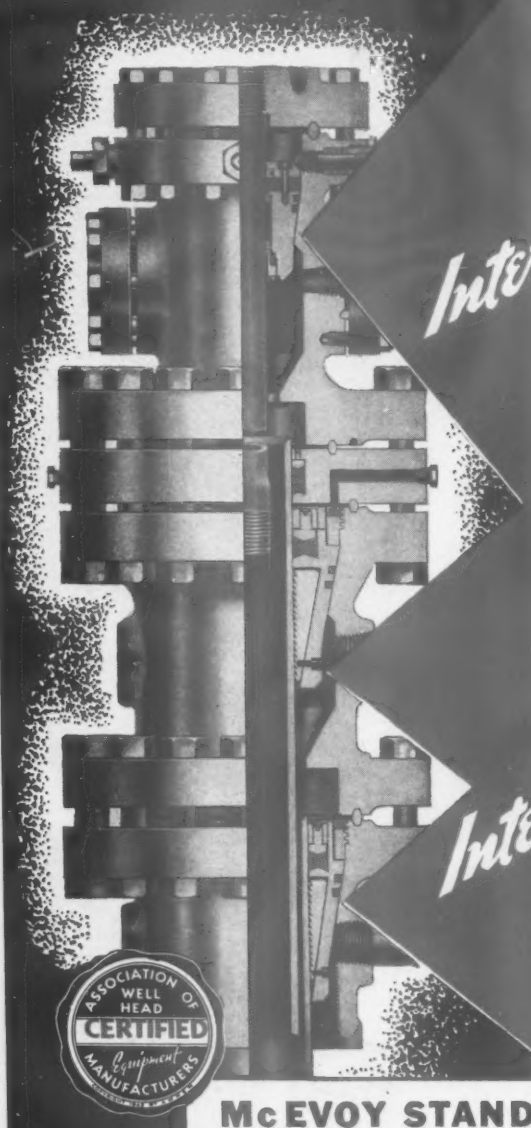
As previously stated the choice of general bit types is very limited. Two main types are available—the fishtail or scraper type, and rock bit or crushing type. Variations and

A view of one of many plants designed and constructed by Petroleum Engineering, Inc., in the past 16 years of continuous service to the industry. Petroleum Engineering, Inc., Offices: Tulsa and Houston.

Photographed for Petroleum Engineering, Inc.
By Robert Yarnall Richie

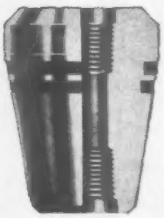
McEVOY CASING and TUBING HANGERS Permit any type of Completion.

New.



Interchangeable

TUBING HANGERS

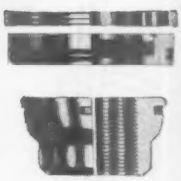


ALB

Threaded mandrel hanger for use where completion methods do not require a specialized hanger.

Interchangeable

CASING HANGERS



LHCS-1

Affords a non-welded seal for utmost safety. Slips may be locked together and landed through preventers if desired. This hanger is highly desirable where N-80 pipe is being set, due to difficulty of obtaining a satisfactory weld on this class of pipe.

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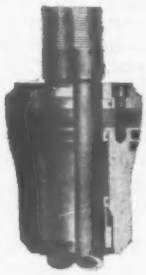
INSPECTION: McEvoy exercises complete chemical and physical control over raw materials and heat treatment. All McEvoy products are subjected to rigid final inspection and test

McEVOY PRODUCTS meet A. P. I. standards and the standards of the Association of Well Head Equipment Manufacturers. Satisfactory field service is further assured by the addition of McEvoy standards.

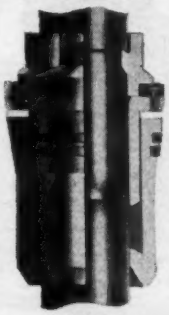
McEVOY HANGERS

added to the McEvoy line



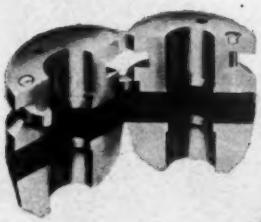
AFB-3

Polish Joint Type which incorporates an additional means of sealing with tubing head lock screws.



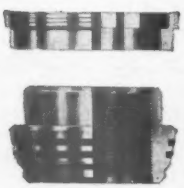
ASTM

Permits running and landing of tubing through assembled christmas tree. This hanger is designed to permit any method of well completion.



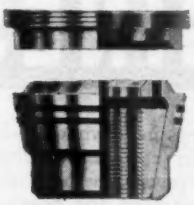
ALK

Used in completions where a polish joint hanger would otherwise be applied, this hanger eliminates the polish joint, since a seal can be effected on any joint of tubing. It can also be used as a blowout preventer.



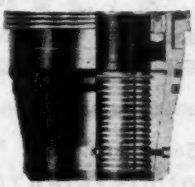
LHCH

Threaded mandrel hanger permits landing of casing through preventers and is satisfactory where close spacing of pipe is not necessary.



LHCLWS

The LHCLWS Casing Hanger utilizes slips for suspension and welded seal. Slips are assembled inside housing and complete assembly may be landed through blow-out preventers.



LHCS-2

Simplified slip-pack hanger for extremely long strings of casing.

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Hangers other than those shown above are available for special purposes. *Consult us on all your completion problems.*

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Kansas
Carson Machine & Supply Company, Great Bend

Illinois — Missouri
Western Machinery Company, Centralia, St. Louis

Michigan
Hofer Engine Service — Reed City

Rocky Mountain Area
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Northern Louisiana & Mississippi
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P-57

combinations of the two are available and have proved successful under special conditions. The operators should demand precision work and the best of materials in the manufacture and repair of any bits used, as he can obtain greatly increased footage for little, if any, extra bit cost, by the correct use of the best bits. Changing from one make of bit to another in similar formations in one well is undesirable, unless close performance figures are kept, because uniformity of bit quality is a factor which helps the driller to do his best work.

The performance of bits of any type is mainly in the hands of the driller who can overload and abuse the best made and thus fail to obtain the footage built into the bit.

Some operators are impressed by high hourly footage rates, whereas others are willing to reduce these high rates for more footage at lower hourly rates. The best balance of these two factors gives the best results and lowest bit cost per foot.

The true cost per foot of running a bit is determined by the following formula:

$$\text{Drilling cost} = \frac{A(B+C)+D}{E}$$

Let A = Cost of rig per hour
B = Hours bit on bottom
C = Hours to round trip
D = Cost of bit
E = Feet drilled by bit

As can be seen, when wells become deeper and round-trip cost increases, higher bit costs are justified, provided the same number of hours on bottom are obtainable and the footage is equal.

Many operators determine bit cost by dividing the bit cost only by the footage obtained. The use of the above formula can produce cases where the comparative economy of one make of bit against another is reversed when compared with the cost per bit divided by the footage obtained.

The above formula is important in determining bit economy on deep wells, especially when comparing performance of one or more types of bits.

Safety

(a) Personnel.—A considerable effort has been made both by the operators and manufacturers of drilling machinery to provide equipment with proper safety factors, guards, and other devices to give safe working conditions. Due to the continual handling of heavy weights directly over the heads of the drilling crews, careful construction and maintenance of the equipment are necessary. Use of heavy tools and handling heavy pipe, when going

in and coming out of the hole, require an ever-watchful eye on the part of the driller to see that his crew is constantly on the alert and clear of danger.

Special attention must be paid to the drilling cable, elevators, blocks, hooks, and links, on which the immediate safety of both crew and well depend. These items should be regularly inspected and checked for possible cracks and flaws. As previously stated, no welding repairs should be permitted on the load-carrying parts without the manufacturer's approval.

Catheads, catlines, and spinning ropes are the next most dangerous items on a rig and should be kept in constant good repair to avoid accidents.

The training of each man on the crew to know his job properly is the best insurance of a smooth and safe working group. Safety on a drilling rig is a job which, as in other places, has to be worked on to be maintained.

(b) **The well.**—The safety of the well is also dependent upon the hoisting equipment in the derrick but is menaced by even more factors than is the crew.

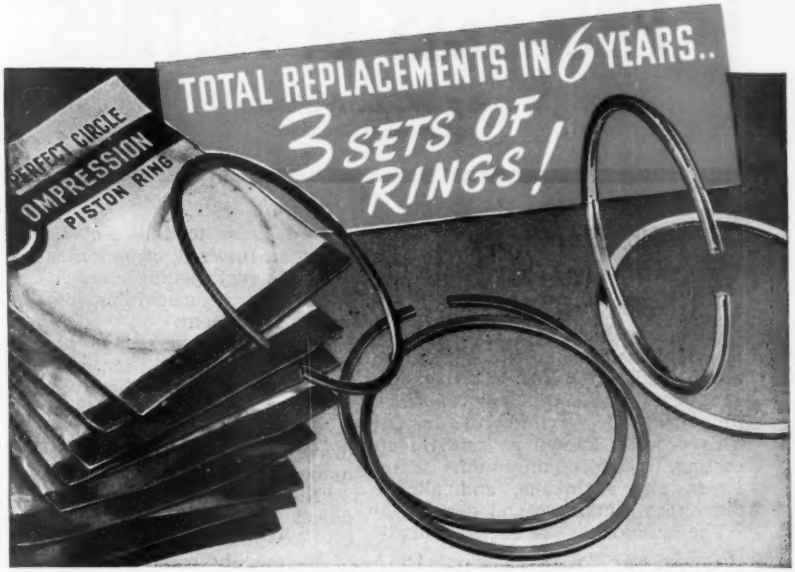
Failure of the hoist, steam supply, drilling engine, drill pipe, etc., can all cause serious trouble and possibly lose the well.

Regular inspection and checking of the critical members mentioned is necessary in order to reduce the possibility of failures. The deeper the well being drilled, the more time and money can be spent on proper inspection to avoid failures and the more this checking becomes necessary due to the higher stress loading of and fatigue effects on all the well equipment.

In addition to the above, well safety requires constant checking of the condition of the drilling mud and blowout preventers. The driller must be sure that the mud is kept in the best condition to avoid blowouts and that, if this first line of defense is breached, the second line, or blowout preventer, is in a position to hold.

As a matter of descriptive terminology, the drilling mud could be called the "blowout preventer" and the blowout preventer the "blowout suppressor." This would be a more accurate description of the true function of the two with respect to well safety.

The price of safety on oil wells, either for the prevention of accidents to the crew, or the well, is constant and systematic vigilance. This vigilance becomes more essential and profitable as wells become deeper. Relaxing of vigilance almost invariably causes "more haste, less speed" as the minimum penalty, and disaster as the maximum.



Briggs Lube Oil Clarifier on 150 HP Cummins Diesel Shows Value of Effective Lube Oil Filtration . . .

The record of savings in lube oil and engine maintenance that a Briggs Lube Oil Clarifier and a Briggs Fuel Oil Clarifier produced on this engine is typical of what really effective filtration can do . . . and will do . . . for you.

Compare facts like these with the operating record of your engine or engines . . . Operating hours, 24 hrs. per day . . . Oil change periods used to be every 250 to 300 hours, *now 3 years elapse between oil changes* . . . Piston rings only replacement parts (routine, whether needed or not) since installation of Briggs Clarifiers—6 years ago . . . Fuel pump screens have not been dirty enough to clean since Clarifiers were installed.

Look in your classified telephone directory under "Filters"—find the name of your Briggs Distributor. Get the complete, amazing story of Briggs Clarification from him or write direct for literature. No matter what size or type internal combustion engine you operate—there is a Briggs Clarifier designed to do an effective oil filtration job for it.

D-3-AX Briggs Lube Oil Clarifier which set this performance record. The Cummins Diesel powers a generator that provides light and power and motive power for an air compressor in the shops of Bennett and Landgren Co., Chicago, Illinois.
Briggs

Briggs

BRIGGS CLARIFIER CO. PIONEERS IN MODERN OIL FILTRATION **General Offices, Washington 7, D.C.**

XUM

PROGRESS IN METALS

by W. L. Nelson
Consulting Engineer

Alloy Iron Pump Liners Centrifugally Cast

THE use of specially prepared molds which rotate at a high speed about their own axes is an economical and efficient method for the mass production of superior-property hollow-cylindrical shapes. This process, known as centrifugal casting, permits minimum scrap losses and shrinkage, and allows maximum soundness and density.

The inside diameter of centrifugally cast pipe or cylinder is controlled by the amount of metal poured into the mold and the outside diameter by the size of the mold. The exterior shape can be altered to some extent by the use of cores or the shape of the mold but the inside must be round.

Alloy iron liners for oil-well pumps are being cast by Centrifugal Casting Co. of Long Beach, Calif., and the operations are discussed in the first quarter 1945 Nickel Cast Iron News. In addition to plain cast iron and the regular grades of alloy iron, certain special cast irons, such as Ni-Hard (4.5 nickel, 1.5 chromium) and Ni-Resist (14 nickel, 3.5 chromium, 6 copper) are being manufactured.

Two Processes Combined

Since the process is best adapted to mass production, which is one of the conditions which make use of permanent molds economical, the two processes—permanent molding and centrifugal casting—have been combined to turn out a quantity of such parts as alloy iron liners for pumps employed in subsurface oil wells. These vary from a maximum size of 5-in. o.d., 3½-in. i.d. down to 1¼-in. o.d., ¾-in. i.d. The smaller diameters, particularly, require the utmost care and skill in casting. The metal is melted in electric furnaces for close control, and holding furnaces are used to maintain uniform pouring temperatures. Spinning speeds, spinning time, temperature of the metal, and diameter and length of the casting are all important factors which have to be properly coordinated for satisfactory results.

Centrifugal casting gives sound, dense castings because the metal solidifies on the outside of the mold first and the centrifugal force throws nonmetallic inclusions and the dissolved gases to the center of the cylinder. Internal unsoundness is not likely in such castings, and in many operations the machining losses are under 1 per cent.

Pump-plunger castings are furnished in "Ni-Hard" for equipment operating in highly abrasive fluids. The hardness of Ni-Hard centrifugal castings is 60/62 Rc. after a drawing treatment at 800° F. for 6 hours.

"Ni-Resist" liners have been produced by the Centrifugal Casting Co. for pumps where the fluid is of a severely corrosive nature. In many instances the normal composition has been modified by raising the chromium as high as 8 per cent to increase hardness. With the latter material, using chill molds, the hardness on the outside diameter runs around 31 Rockwell C, and on the inside surface 20 Rc.

The 20 per cent nickel type of Ni-Resist is specified for liners employed in the production of synthetic rubber from butadiene. In addition to pump liners of various types, the Centrifugal foundry has produced gear blanks and bushings in alloy cast iron compositions.

Cast Iron for Construction

THE following abstract of the excellent article by E. Piwowarsky in Die Giesserei, June 1943, was made by the Engineers' Digest. The article forcefully points out the new applications that cast iron is finding as a result of recent developments in the theory of engineering and machine design.

With the partial abandonment of former conceptions of strength and the gradual development of a new theory of design, cast iron has been given a new impetus as a construction material. While earlier ideas of strength were based upon the elastic behavior of the material, present-day tendencies are toward the consideration of contour, damping, surface condition, local stress concentration, and other factors.

Cast iron, while having small static elongation, exhibits to a large extent the properties of high damping, low notch sensitivity, and high resistance at the root of the notch. It shows a particularly pronounced property of distributing local stress to neighboring zones.

While steel exhibits an increase in damping capacity with increasing stress, good damping characteristics in the low stress range encountered in practice is an almost unique property of cast iron. Cast-iron crankshafts proved to be very successful in resistance to fatigue.

Modern high-grade cast iron can be competitive with wrought steel, since it is easily given a required shape and is readily machined.

Difficulties in Welding

Steel above 0.35 per cent C offers certain difficulties to welding. Strength values of welded parts of carbon content below 0.35 per cent are not much higher than those of high grade cast iron.

In judging the brittleness of cast iron, consideration must be applied as to whether the stresses involved lie above or below the fatigue limit. Piwowarsky has suggested the terms "dynamic brittleness" or "dynamic toughness" for impact loads below the fatigue limit, and "blow brittleness" or "blow toughness" for destructive blows. The increased tensile strength obtainable from high-grade cast iron is known to be accompanied by extraordinary increase in impact fatigue strength.

By careful avoidance of abrupt changes of section and use of large corner radii, it has been found possible to produce cast-iron crankshafts with a fatigue strength 25 per cent greater than that of a comparable crankshaft of forged alloy steel.

A development used for only a few parts in the past, but showing promise for the future, is the use of reinforced cast iron. Use of 3 to 5 per cent by weight of steel reinforcement leads to an increase of 2.5 to 3.5 times the bending strength.

Metallurgical Terms

Black Annealing and Bright Annealing

Black annealing is a method of annealing sheets or other products, used when it is not important that the product be free from scale or discoloration.

In contrast, bright annealing is conducted in a closed container having a reducing atmosphere which prevents oxidation or discoloration of the surface by oxygen.

Cold Shut and Seam

A place in the metal where two portions of the metal in either a molten or plastic condition have come together but have failed to unite into a solid mass, is referred to as being cold shut.

A seam is a crack caused by a blowhole or other defect which has been closed but not welded.

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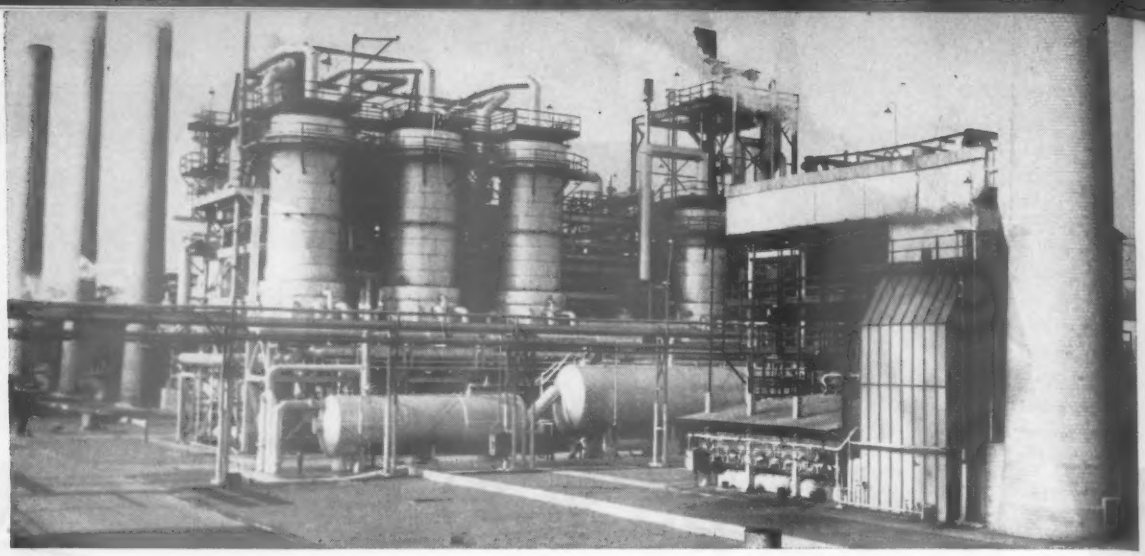


View showing a typical Houdry process unit at the Sun Oil Co. refinery at Marcus Hook, Pa.

Operating Report on Gas-Turbine Use In Sun Oil Co. Refineries

by Arthur E. Pew, Jr.*

A. General Facts

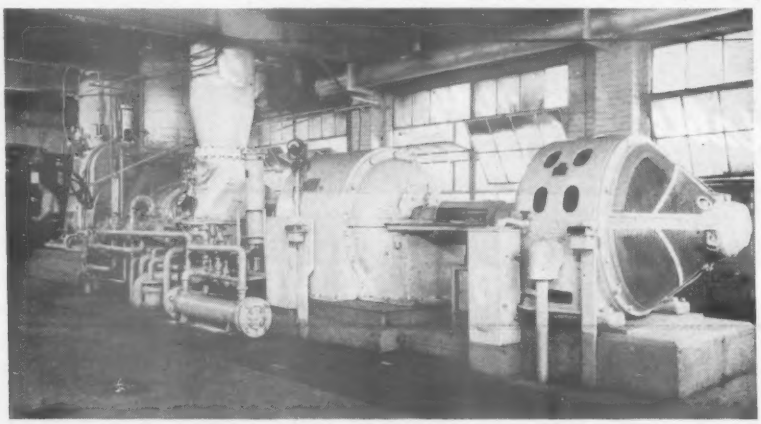
PRIOR to 1936, Sun engineers, working in conjunction with the Houdry Process Corp., adapted the Brown-Boveri gas turbine and axial compressor to supply air in large quantities and at comparatively high pressures for catalyst regeneration in the Houdry process of catalytic cracking. At the Marcus Hook, Pa., refinery of Sun Oil Co., there was placed in operation, in the latter part of 1936, the first successful large gas-turbine unit in the United States.

*Vice president, Sun Oil Co. A paper presented at the Chicago section meeting of the American Society of Mechanical Engineers, June 19.

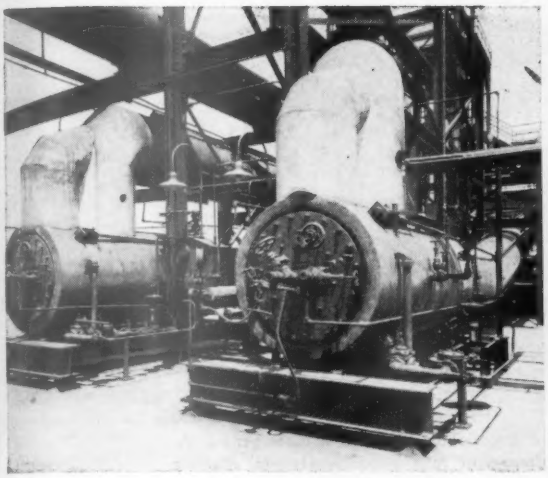
In the operation of the Houdry catalytic process for aviation and high-octane gasoline, it is necessary, for maximum efficiency, to maintain the catalyst in a state of high catalytic activity. For plants charging to the catalyst approximately 10,000 bbl. per day, the air requirements are approximately 40,000 cu. ft. per minute at 45 psig. In order to obtain this quantity of air at this pressure, approximately 5,600 hp. is required.

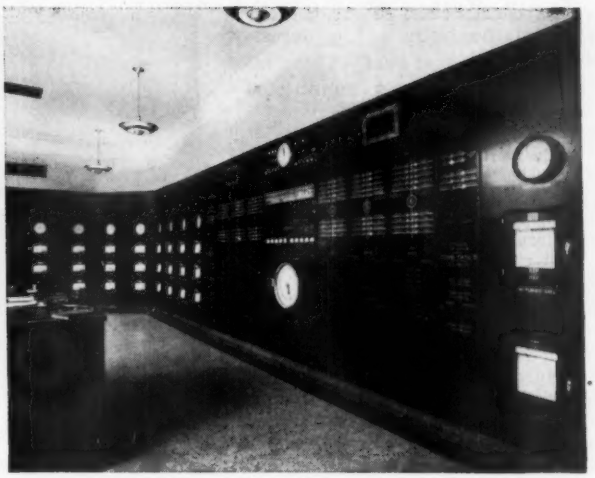
A brief description of the Houdry catalytic-cracking operation, using the gas turbine, is necessary for an understanding of the performance records which are given hereafter in this report.

Oil is vaporized and passed through a catalyst. As one of the results of the chemical changes which occur, carbon is deposited on the catalyst. The efficiency of the catalyst is decreased by such deposits which must be periodically removed. The catalytic containers are arranged so that the operation of carbon removal is continuous, on a cycle basis, certain containers being regenerated while others are operating on the oil cycle. The cycles from container to container are automatically controlled on a predetermined basis. The carbonaceous deposit is oxidized by the air from the compressor and the products of combustion passed to a gas turbine which in turn drives the axial compressor supplying air at 45 lb. pressure to the catalyst-regeneration units. The heat content of the products of regeneration exceeds the energy necessary for the compression of the regeneration air. The excess is recovered as electric power and steam for use in the process. In the usual installation, gas temperatures at the turbine inlet are 875° to 950° F. and are exhausted at about 550°. Inlet pressure to turbine is about 40 psig. and outlet pressure of compressor is about 50 psig.



Sun Oil 40,000-cu.-ft.-per-minute turbocompressor installation with motor starter





Left: Combustion chambers used in a Sun Oil Houdry process unit. Shown are burners, air-discharge line from compressors, lines to catalytic cases, and return lines to gas turbines. Right: Control room for a Sun Oil Houdry process unit, showing meters, control panel, and recorders

B. Extent of Use

As of this date, there are in use in the United States, 26 gas-turbine units on Houdry cracking plants. Twelve units are of 23,000 cu. ft. per minute normal rating, 13 units of 40,000 and 1 of 60,000 cu. ft. per minute.

Table 1 lists present installations in the United States.

There have been installed in Sun Oil refineries, seven gas turbo-compressor units, the first one in 1936 and the most recent in 1943. Table 2 lists pertinent data on these units.

C. Description of Sun Units

The gas turbo-compressor units as used by the companies listed in Table 1 are all of the same general design, other than capacity. The principal specifications are as follows:

Capacity compressor unit (based on 60°), c.f.m.	23,000-60,000
Suction pressure (based on 60°)	atmospheric
Discharge pressure, psig.	45
Turbine gas quantities, 40,000 cu. ft. size, lb./min.	3,170
Pressure, turbine inlet, psig.	40
Temperature, turbine, inlet, °F.	800-950
Speed of set, r.p.m.	5,180
Weight of set, 40,000 cu. ft. size, lb.	70,000

TABLE 1—SUMMARY OF TURBO-COMPRESSORS IN SERVICE ON STATIC BED HOUDRY UNITS

Company and location—	Turbo-compressors — Nominal rating No.	(c.f.m.)	Manufacturer
Sun (11-4), Marcus Hook	1	40,000	Brown-Boveri
Magnolia, Beaumont No. 1	1	23,000	Brown-Boveri
Sun (12-3), Marcus Hook	1	40,000	Brown-Boveri
Socony, Trenton, Mich	1	23,000	Allis-Chalmers
Socony, Brooklyn, N. Y.	1	23,000	Allis-Chalmers
Sun, Toledo, Ohio	1	40,000	Allis-Chalmers
Magnolia, Beaumont No. 2	1	40,000	Allis-Chalmers
Socony, Buffalo	1	23,000	Brown-Boveri
Socony, East St. Louis	1	23,000	Brown-Boveri
Socony, Augusta, Kans.	1	23,000	Allis-Chalmers
Socony, Paulsboro, N. J.	1	23,000	Brown-Boveri
Sun (12-3 Ref.), Marcus Hook	1	*23,000	Allis-Chalmers
Sun (10-3), Marcus Hook	2	40,000	Allis-Chalmers
Tide Water, Bayonne, N. J.	1	60,000	Allis-Chalmers
Socony, East Chicago, Ind.	1	23,000	Allis-Chalmers
Standard Oil of California, El Segundo, Calif.	1	40,000	Allis-Chalmers
Gulf Oil Corp., Port Arthur	1	40,000	Allis-Chalmers
Sun (15-1), Marcus Hook	1	40,000	Allis-Chalmers
Sinclair Ref., Houston	1	40,000	Allis-Chalmers
Magnolia, Beaumont Nos. 3 and 4	2	23,000	Allis-Chalmers
Sinclair Ref., Corpus Christi	1	40,000	Allis-Chalmers
Southport Pet., Texas City, Tex.	1	40,000	Allis-Chalmers
Standard Oil of Ohio, Cleveland	1	40,000	Allis-Chalmers
Standard Oil of Ohio, Cleveland	1	23,000	Allis-Chalmers

Summary

Number	Nominal rating (c.f.m.)
12	23,000
13	40,000
1	60,000

*23,000 c.f.m. casing with blades cut for 16,000 c.f.m. output.

TABLE 2—TURBO-COMPRESSOR INSTALLATIONS, SUN OIL CO.

Location—	Cap. Std. (c.f.m.)	R.p.m.	Means of starting	Date in service	Type thrust bearing
M.H. 11-4†	40,000	5,180	Motor	Dec. 1936	*Angular contact ball
M.H. 12-3†	40,000	5,180	Motor	July 1939	*Angular contact ball
Toledo 3‡	40,000	5,180	Motor	Aug. 1939	*Angular contact ball
M.H. 12-3‡	16,000	6,050	Turbine	Nov. 1940	*Angular contact ball
M.H. 10-3‡ N	40,000	5,180	Turbine	Dec. 1940	*Angular contact ball
M.H. 10-3‡ S	40,000	5,180	Turbine	Jan. 1941	*Angular contact ball
M.H. 15-1‡ S	40,000	5,180	Turbine	Aug. 1943	Kingsbury

All compressors 45 psi. discharge pressure. All units have 1,500-hp. synchronous motor generators except 16,000 cfm. has 500 hp.

*Angular contact bearings removed. Kingsbury installed since 1943. †Manufacturer: Brown-Boveri. ‡Manufacturer: Allis-Chalmers.

Table 3 lists equipment required for the 40,000 cu. ft. per minute turbo-compressor units as installed at Sun Oil Co.

TABLE 3—EQUIPMENT 40,000 C.F.M. TURBO-COMPRESSOR UNITS

Gas turbine — Brown-Boveri or Allis-Chalmers; 6,200 hp., 950° F. reaction type, 5 stages.

Compressor — Brown-Boveri or Allis-Chalmers; axial type, 20 stages.

Governor and oil pump—Brown-Boveri or Allis-Chalmers.

Auxiliary oil pump—Brown-Boveri, Roper, Allis-Chalmers.

3 per cent overspeed valve—Brown-Boveri, Allis-Chalmers, Republic.

10 per cent overspeed valve—Brown-Boveri or Allis-Chalmers.

Oil coolers—Andale or Griscom-Russell.

Oil filter—Nugent cloth filter (emergency); Shriver blotter press (normal opr.).

1,500-hp. syn. motor—Allis-Chalmers; 2,300 V-1792 r.p.m.

Starting units—Motors, Allis-Chalmers, or General Electric; steam turbines—Moore.

Reduction gear unit — Moore; between starter and 1,500-hp. motor.

Reduction gear unit—Falk Herringbone or Brown-Boveri; between 1,500-hp. motor and turbo-compressor 5,166 to 1,800.

D. Materials

Table 4 shows the material used

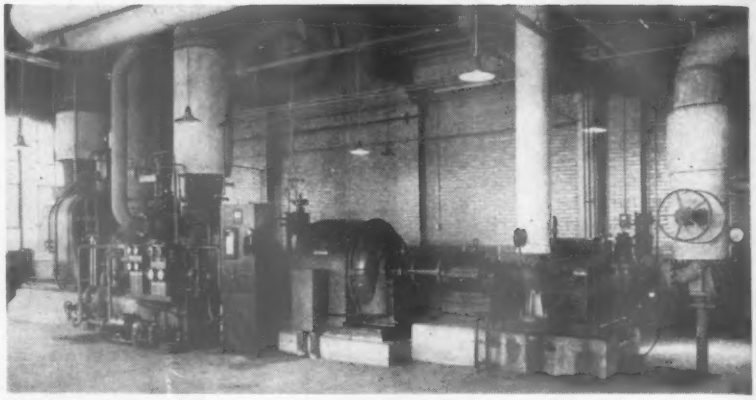
in the construction of the principal parts of the turbo and compressor units.

TABLE 4—MATERIALS TURBO-COMPRESSOR UNITS

Sealing strips—18 chrome-8 nickel (originally were nickel).
Gas turbine blades—stainless steel.
Compressor blades—nickel steel.
Gas turbine spindle—chrome nickel steel forging.
Gas turbine cylinder—molybdenum cast steel.
Compressor spindle—steel forging.
Compressor cylinder—cast iron.
Bed plate—cast iron.

E. Method of Operation

Diagram 1 shows diagrammatically the arrangement of gas-turbine blower generator and starting motor or turbine interconnected with a catalytic cracking unit. In starting up, the turbine is rotated at approximately 2,000 r.p.m. for several hours by means of the starting motor or starting steam turbine, while bearings are warmed up and equipment checked. During this time the air delivery from the compressor is circulated through a bypass to the turbine. After partial speed, i.e., 25 to 30 per cent of normal, has been reached and the units checked, the temperature is brought up by the pressure burner preceding the turbine. The volume of air being circulated and the pressure is raised over a period of 8 to 10 minutes by gradually bringing the unit up to its full speed of 5,180 r.p.m. The heat of the discharge air is then gradually raised by the air heater located on the discharge side of the compressor and the air thus heated is passed to the catalytic cases. Following this, the gases from the catalytic-cracking case, resulting from the regeneration of the carbonaceous deposits, supplies the energy for the operation of the turbo-compressor unit, and pressure burners are shut off.



Sun Oil installation of a 40,000-cu.-ft.-per-minute turbocompressor with steam turbine for starting

Under normal operating conditions, the amount of excess power supplied to, or developed by, the unit depends upon the type of catalytic-cracking reaction being practiced, i.e., with increase in carbon deposition, power will increase. In general, with air temperature at 60° F. to the compressor and with gas temperature to the turbine at 950° F., the 40,000 cu. ft. per minute units will generate up to 900 kw. excess over required power for driving the compressor.

F. Service Record

Table 5 shows the number of operating days on each of six Sun Oil installations in relationship to the number of days shut down on account of turbo-compressor difficulties. The plants are listed in the order of their installation.

Under the heading "Days off account turbo trouble" is included time chargeable to the complete turbo-compressor unit and the equipment in connection therewith necessary for operation. The time shown represents the time required for making repairs. It is believed by Sun's operating division that time off due to turbine troubles and troubles in connection with turbines has not been excessive under the conditions encountered.

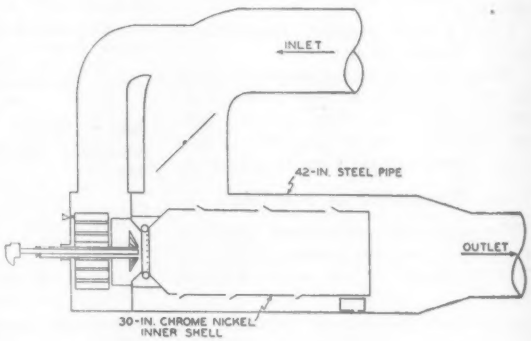


Diagram 2

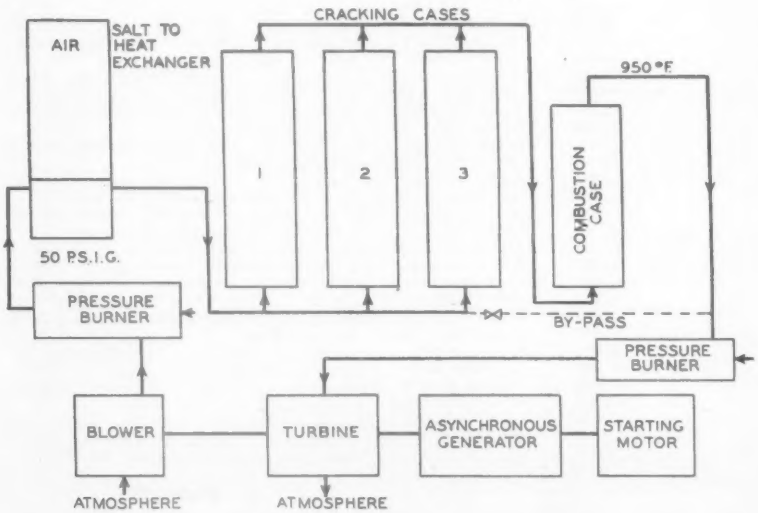


Diagram 1

TABLE 5—SUMMARY TURBO-COMPRESSOR OPERATION TO MAY 31, 1945

Location plant	Operating days	Days off acc't. turbo trouble	Total days	% time turbo trouble
11-4	2,607	50	2,657	1.88
12-3 C	1,900	21	1,921	1.09
12-3 R	1,413	45	1,458	3.10
10-3 N	1,404	34	1,438	2.36
10-3 S	1,365	29	1,394	2.08
15-1 S	569	0	569	0.00

G. Failures Causing Turbo-Compressor Outages

Table 6 shows failures causing outages in the order of their prevalence.

TABLE 6—FAILURES CAUSING TURBINE OUTAGES

1. Bearings.—Thrust bearings. Spring

rings (roller bearings). 1,500-hp. motor bearings.

2. Lubrication. — Dirt in oil sprays—causing bearing failures. Water in oil (condensate) causing bearing failures. Main oil pumps—broken shaft spline as result of bearing failures. Auxiliary oil pump—failure to start when main pump failed.

3. Blades.—Loose blades—latest design with integral root, no loose blades in 22 months on one unit. Erosion—gas-turbine blades.

4. Air seal strips (failure does not necessarily cause shutdown).—Material. Rubbing, due to change in alignment. Expansion joints—harness.

5. Explosions.—11-4 bypassing air into oil vapors—experimental case. 12-3 reformer—air bypassed into oil vapors. 12-3 cases—gas explosion—gas burner opened by mistake. 10-3 dirty oil burner—no atomization.

6. Miscellaneous. — Foreign objects in compressor or turbine. Failure to synchronize before cutting motor in when starting unit.

Table 7 classifies failures causing turbo-compressor outages in relation to number of failures and days lost for each type of failure.

It will be noted that out of 46 failures, 29 were caused by bearing trouble and that out of 179 days lost time from all causes, 101 days were due to failures of bearings. In this connection, Table 2 shows the type of bearings installed in Sun Oil units. It was found early that angular contact ball-bearing type of thrust bearing was not satisfactory for the conditions encountered and as shown by Table 2, the angular contact bearings have all been replaced with the Kingsbury type thrust bearing with the exception of one unit at Marcus Hook which is now being changed. There have been no thrust-bearing failures or bearing repairs since the Kingsbury type has been installed. The first Kingsbury bearing was installed on a Sun Oil unit in June 1942, and has been in satisfactory operation since that time. The other units were converted at various times in the interval. In view of the record of no failures, it is believed reasonable to assume that this type of bearing is satisfactory for these units. It may fairly be assumed that had Kingsbury thrust bearings been used from the beginning, the total time lost would have been reduced approximately 60 per cent.

It will be noted from the above tables that lubrication difficulties caused a loss of 28 days with six failures due to lubrication. Lubrication difficulties were caused by dirt in the oil sprays, condensate in the oil, broken shafts in main oil pumps as the result of bearing failures, and failure of auxiliary oil pumps to start when main pump failed. It is believed that lubrication difficulties have been largely overcome by the installation of blotter presses, and there have been no lubrication failures since these installations have been made.

Failure of blades in either the compressor or the turbine was responsible for four shutdowns of 19 days' lost time. These failures are caused by blades becoming loose as a result of an original design in which the blade was not integral with the root. Later designs by Allis-Chalmers Co. have provided an integral root blade, and no trouble has been observed in over 22 months' operation in a Sun unit with this type of blade. There has been some trouble noted from erosion of the gas-turbine blades due to fine particles of catalyst being present in the gases or small deposits of carbon dust. Experimental work is being done to eliminate this condition by trapping the air entrances to the turbine. The erosion noted has not been of sufficiently great extent to be an important problem.

The above tables indicate one shutdown of 3 days' duration for failure of air seals. Air seal strips are subjected to rubbing due to change in alignment and gradually wear out. However, these may be repaired during a normal shutdown without excessive difficulty and are not considered as being a weakness which might necessarily cause shutdowns. However, improvements in air seals become more important as shutdowns for other causes are eliminated.

There have been three shutdowns of 12 days' duration total due to explosions. These explosions are not due to turbine design, but are the result of errors in operation or failures in handling other parts of the equipment serviced by the turbines. None of the three explosions was of sufficient intensity to rupture the equipment.

Under the column headed "Miscellaneous", there were three shutdowns of 16 days' duration due to errors in maintenance. In one case a foreign object was left in the air compressor causing blading to be stripped.

Summarizing, the bearing failures, lubrication failures, and blading failures are the three principal causes of shutdowns and accounted for 148 days' lost time out of the total of 179 days and for 39 shutdowns of the total of 46. It is believed that the changes described above have satisfactorily and substantially eliminated these causes of shutdowns.

Probably the most important consideration with regard to installation arrangement is ample provision in the piping to reduce strains to a minimum. The piping to the turbine and compressor units is unusually large, the air inlet to the compressor on the 40,000-cu. ft. per minute machine is 36 in. and the air outlet 30 in. The gas inlet to the turbine requires a 30-in. pipe and the exhaust a 36-in. pipe.

Due to the high temperatures of the piping to the turbine, provision must be made to handle the expansion and contraction as the machine is relatively light in construction and the speeds high, making it essential that the alignment be accurately maintained. The design of the burners used for starting the turbo-compressor requires careful consideration. Diagram 2 shows the arrangement of the combustion chambers ahead of the air heater and the turbine.

Air at a temperature of approximately 350° and 45 lb. pressure from the outlet of the air compressor enters the combustion chamber through a 30-in. pipe. The air flow is divided at this point, a portion of it passing through an air register and thence to the oil burner for combustion. The balance of the inlet air passes through a control damper and around the outside of a 30-in. chrome nickel shell inserted in the 42-in. steel pipe. The inner shell has a number of perforations so arranged as to cause an infiltration of air into the inner shell in such a manner as to create a swirling and mixing action within the inner shell and thereby provide cooling of the shell walls. The products of the combustion and the excess air commingle at the outlet of the 42-in. pipe section and pass therefrom to the catalytic cases for regeneration of the catalyst. The temperature of the mixture is approximately 950° and the temperature within the inner shell is approximately 2,000°. The air capacity of the burner is approximately 40,000 cu. ft per minute at 45 lb. pressure. No refractory material is used. This type burner has operated for a number of years with entirely satisfactory results. The design is an adaptation by Sun Oil engineers from the basic design of Brown-Boveri Corp.

Arrangements of valves, control instruments, etc., have been worked out on the basis of experience and have given satisfactory results. Detailed description of the installation

TABLE 7—FAILURES CAUSING TURBO-COMPRESSOR OUTAGES

	Bearings		Lubrication		Blades		Air seals		Explosions		Misc.		Total	
	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days	No.	Days
11-4	18	43	..	..	..	..	..	..	1	5	1	2	20	50
12-3 C	4	12	..	..	1	4	1	3	1	2	..	..	7	21
12-3 R	4	31	3	14	..	..	..	..	..	..	..	..	7	45
10-3 N	3	15	3	14	..	..	..	..	1	5	..	..	7	34
10-3 S	..	..	..	..	3	15	..	..	..	..	2	14	5	29
15-1	..	..	..	..	..	..	..	..	..	..	..	..	0	0
Total	29	101	6	28	4	19	1	3	3	12	3	16	46	179

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is considered too lengthy to be incorporated in this report. However, it may be said that the installations are not complex and involve no special operating or maintenance difficulties.

I. Maintenance Costs

The cost of maintenance and repairs of the various units listed in this report has varied from a high of approximately $1,000 a month to a low of $300. Maintenance and repairs may be conservatively estimated on units as they are now developed as not in excess of 3 per cent per year of capital investment. The most costly repair is the reblading of the gas turbine which, under present conditions, is estimated at $13,000 of which approximately $12,000 is for blades. The cost of cleaning the units has averaged about $300 per year.

J. Summary

The operating record of the gas turbo-compressor units of Sun Oil's plants have been such as to justify, in the opinion of Sun's engineering organization, the continuation of the use of this type of equipment in future installations. The cyclic operation of the Houdry units requires the steady flow of regeneration air under varying pressure differentials and also changes in the system pressure differentials due to changes in operating conditions. The quantity of air delivered by the axial flow compressors discussed herein fluctuates less than 1 per cent for 20 per cent variation in discharge pressure as opposed to approximately 20 per cent or more for similar changes in pressure conditions in the case of centrifugal compressors. There has not been offered a suitable centrifugal compressor nor a prime mover to replace the gas turbine meeting the requirements of economy and efficiency necessary in connection with the regeneration of catalysts in the Houdry catalytic operation.

In this application, it is necessary to handle gas at high pressures and in large quantities utilizing combustion products resulting from the chemical reactions obtained from the catalytic cracking processes. It is obvious that a catalytic plant requiring 40,000 cu. ft. per minute at 45 lb. pressure cannot obtain high economic efficiency if it were necessary to compress this amount of air without using resultant combustion products as the source of power for the compression of the air.

Acknowledgment

The assistance of C. H. Thayer, chief engineer, and H. E. Melton, assistant superintendent, power division, Sun Oil Co., in the preparation of this report is acknowledged and appreciated by the author.

Engineering Fundamentals

No. 198

A FEATURE OF THE OIL AND GAS JOURNAL

Preventing Corrosion in Water-Disposal Systems

PREVENTION of corrosion is important in water-disposal operations not only to protect tanks, fittings, filters, and pumps used in handling salt water, but also to prevent metallic iron from going into solution in the water. The more soluble iron in the water, the more iron has to be precipitated, settled out, and filtered when using the open system of water disposal.

Causes of corrosion. — Corrosion in oil fields is generally attributed to the following:

1. Oxygen, either free or dissolved in the water.
2. Carbon dioxide and hydrogen sulfide dissolved in the water.
3. Presence of other acids in the water (water having low pH values).
4. Electrolysis.

Oxygen corrosion.—Corrosion of tanks and filters due to oxygen may take place either below or above the water line but appears to be worse in the upper parts of the gun barrel, flow tanks, and filters that are alternately exposed to salt water and air. This type of corrosion takes on the form of hard black or reddish-brown flakes which are crusts of iron oxide or scale. Removal of the scale reveals pits in the iron. Most of the scale is porous. Oxygen will penetrate through it and continue to etch, deepen the pits, and form more scale until the steel plate is rusted through. At the same time some of the iron below the water surface goes into solution in the ferrous form, in many places reacting with the carbonates of the water to produce soluble ferrous carbonate and in other places reacting with additional oxygen to form insoluble iron hydroxide. In absence of oxygen the soluble iron may combine with hydrogen sulfide, if it is present, to form ferrous sulfide. The amount of iron in the water in suspension and in solution increases all the way from the bottom of the producing well, where it is practically zero, to the settling tanks where it reaches 15 to 25 parts per million. Where the filters are constructed of steel, even after filtering, there may be 1 to 5 p.p.m. of soluble iron in the water. This soluble iron may eventually precipitate by reaction with oxygen or hydrogen sulfide to produce ferric hydroxide or ferrous sulfide, both of which can clog up filters and input wells. Oxygen can not be eliminated from the water in an open system. Coating tanks and filter with impervious coatings, use of wood, cement, or pressed asbestos, and covering all exposed metal with coatings impervious to oxygen and salt water is helpful in many cases.

Carbon dioxide corrosion.—Corrosion due to carbon dioxide is brought about simply by the action of carbonic acid and metal:

$$H_2O + CO_2 \rightarrow H_2CO_3$$

$$Fe + 2H_2CO_3 \rightarrow Fe(HCO_3)_2 + H_2$$

Corrosion due to carbonic acid appears as a general thinning of the metal which in many places shows a series or successions of grooves. Corrosion of this type appears to be worse where vapors or gas have condensed on the inside and around the tops of enclosed tanks and filters. The pH of the condensed liquid droplets is an indication of the corrosiveness of the solution. The more H_2CO_3 present, the more corrosive is the liquid and the lower is the pH value. Water which has a pH as low as 4.5 or less will corrode iron with liberation of H_2. To avoid this type of corrosion the pH of the water should be increased, if necessary, to 7.5 or 8 by addition of hydroxides, and hexametaphosphate may be added. Parts can be coated with impervious coverings.

Hydrogen sulfide corrosion. — Hydrogen sulfide dissolved in water has acidic properties and causes corrosion by about the same process as carbonic acid:

$$Fe + H_2S \rightarrow FeS + H_2$$

Hydrogen sulfide reacts with iron to produce iron sulfide, a black scale. Iron sulfide is difficult to remove from water once it is formed. In some oil fields, like East Texas, no hydrogen sulfide occurs in the bottom-hole samples of water and first appears in the salt water in the gun barrel tanks. This hydrogen sulfide is thought to be produced by reduction of sulfides in the water by bacterial action. It can be eliminated only by eliminating bacteria from the water, and corrosion by hydrogen sulfide can be prevented only by coating metallic equipment with impervious coatings.

Corrosion due to electrolysis.— Corrosion by electrolysis can be serious wherever stray electric currents, metal, and salt water are present. This type of corrosion is difficult to prevent. Electrolysis which occurs in oil-field equipment simply involves the exchange of electrons between two different metals or heterogeneous parts of the same metal or even between scale and metal having different potentials. Salt water is an excellent electrolyte, so that wherever there is iron near copper—for example, a copper-alloy valve set in an iron pipe—the iron will dissolve and hydrogen gas will plate out on the copper. This type of corrosion is difficult to counteract with coatings. It can be reduced by constructing tanks and filters throughout of the same kind of metal, insulating connections, and by making electrical surveys to detect and eliminate outside stray currents. When currents are found, then the equipment must be isolated, insulated, and grounded from any electrical potentials in the vicinity.

Sometimes flakes of iron oxide, iron, and iron sulfide scale accumulate in the filter sand and, because of their weight, do not wash out. These submetallic accumulations have a different potential from that of the iron of the filter tank. A battery effect is set up through the salt water as a conductor. Iron goes into solution from the filter tank and is deposited in the filter sand, forming concretions and solid cementation of the sand by electrically deposited iron. It is thought that this process can be prevented by using rubber lining in the tank or by heavily coating the interior of the filters. A method may be worked out for using cathodic protection, in which the filter tank is wired to a metal high in the electro-motive series such as magnesium or aluminum, so that the direction of the current in the metal tank will be reversed.

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Series prepared by F. B. Plummer, professor, petroleum engineering school, University of Texas

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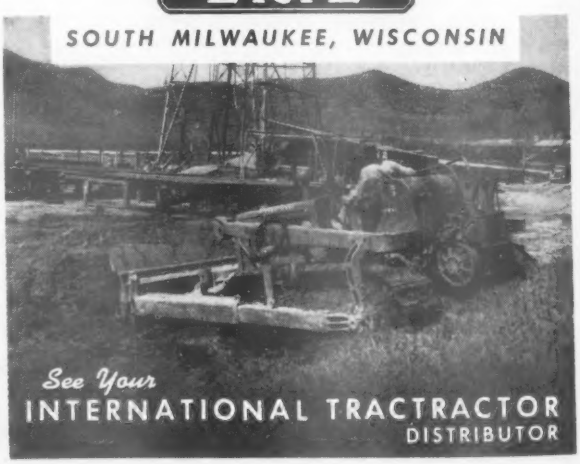

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The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

Tray Details—Bubble Caps

BAFFLE plates and packed towers are used to a limited extent for fractionating towers but a bubble-cap type of construction is usually cheapest, easiest to maintain, and most effective. Side-to-side or similar arrangements of baffle plates are used to stop entrainment in flash chambers and may be used for extremely simple contacting operations, such as steam stripping or the removal of one poorly fractionated product. The packing for packed towers is so expensive that this type of construction has not been widely used for any but the smallest (8 to 20-in. diameter) towers.

The general construction of a bubble cap is indicated in Fig. 1. Literally hundreds of cap designs have been used and hence the design of Fig. 1 is only one way that such a cap can be constructed. To produce a minimum pressure drop from plate to plate, the vapor uptake area and the area of the annular space through which the vapor returns should be the same. Thus, the outside diameter of the vapor riser or uptake should for cast-iron caps be about 66 per cent of the diameter of the bell or cap, and for steel caps it should be about 61 per cent. Likewise, the space between the top of the bell and the top of the riser should be greater than one-fourth of the inside diameter of the riser.

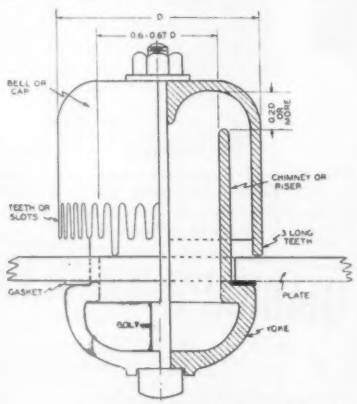


Fig. 1—Removable cast-iron bubble cap

TENTATIVE SCHEDULE OF TOPICS

The general theory of heavy oil fractionating towers is being discussed in eight issues of the Notebook:

No. 39, April 28—Vaporizer Temperature
No. 41, May 12—Stripping Steam
No. 45, June 9—Tower Heat Balances
No. 46, June 16—Types of Reflux
No. 48, June 30—Tower Temperatures
No. 50, July 14—Tower Capacity
No. 51, July 21—Stripper Temperatures
No. 55, August 18—Side Reflux

The particular topics being discussed now are:

No. 48—Tower Temperatures
No. 49—Weight of Towers
No. 50—Tower Capacity
No. 51—Stripper Temperatures
No. 52—Downcomers
No. 53—Foundations
No. 54—Bubble Caps
No. 55—Side Reflux
No. 56—Regulation of I.B.P. and E.P.
No. 57—Dirty Streams

TABLE 1—FEATURES OF BUBBLE CAPS

Outside diameter (in.)—	Chimney or vapor uptake area (sq. ft. per cap)	Slot area (sq. ft. per cap)	Uptake area over column area	Material
2¾	.0085	.0156	.048	C.I.
3	.0232	.0165	.257	Steel
3	.0142	.0167	.130	Steel
4	.0204	.0372	.079	C.I.
4 hex.	.034	.065	.122	C.I.
4	.0208	.0396	.078	C.I.
4	.031	.040	.135	C.I.
4	.029	.045	.148	Steel
4½	.0204	.0348	.066	C.I.
5	.031	.0356	.100	C.I.
6	.0745	.055	.148	C.I.
6½	.042	.0496	.123	C.I.
3 x 10	.1001	.0921	.175	C.I.

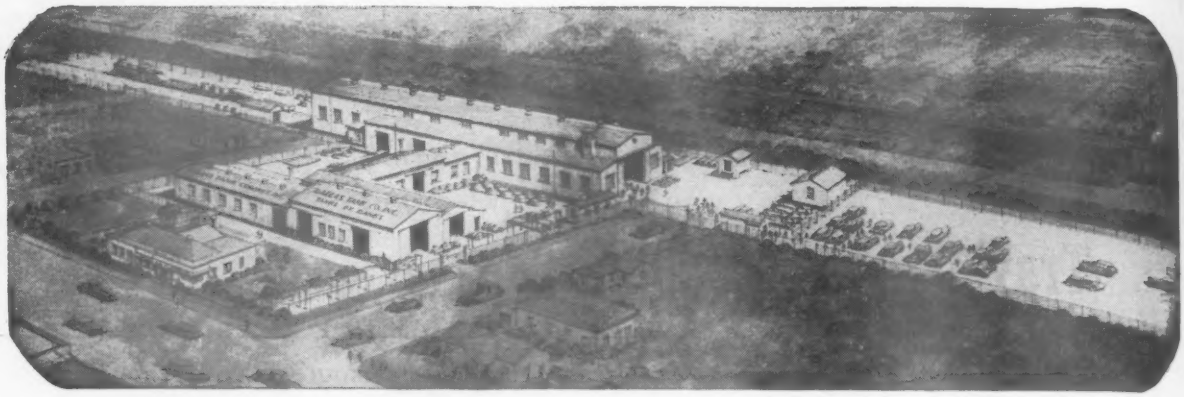
Slot area is of little significance because vapor can escape below the edge of the cap as well as through the slots, but the sum of these two areas should be greater than the area of the vapor riser. The areas of some commercial caps are shown in Table 1. Cast-iron caps are usually spaced with 1½-2-in. clear space between the edges of the caps and with steel caps the space may be as low as 1 in.

Detachable caps as shown in Table 1 have some advantages but due to their cost and the difficulty of assembling them it has become increasingly common to roll or weld the riser into the plate and fasten the cap against the plate by means of a "holddown" bar. The pressure drop per plate in pounds per square inch may be approximated by:

$$P = k s u^2 + 0.022 C$$

in which k is a constant ranging from 0.01 to 0.015, s is specific gravity referred to water, u is velocity through riser in feet per second, and C is the height in inches of liquid (no froth) over the center of the slots.

No. 54 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa



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REFINING

Indiana Standard Expands Engineering Activities

CHICAGO.—Installation of an engineering research department, along with expansion and reorganization of existing engineering activities, is announced by Standard Oil Co. of Indiana. Pursuant to this program George W. Watts has been named director of engineering in the manufacturing department, and D. A. Monro, chief designing engineer of the department. Watts will be in charge of all engineering work in the manufacturing department, but will devote his time principally to engineering research. All other engineering activities will be under Monro.

P. L. Krauel has been appointed chief engineer of the engineering division, Whiting refinery, where the company's largest engineering unit is located. Krauel will be administrative head of the division, which has been enlarged to include six departments, each headed by an assistant chief engineer.

The oil-design department will be supervised by W. G. Guild, acting assistant chief engineer. A. T. Milbrook, assistant chief engineer, will supervise the utility design department. W. K. Brown has been appointed acting assistant chief engineer in charge of the newly-created plant-engineering department. C. E. Dyckman is made assistant chief engineer, estimating department. W. R. Burrows will be in charge of the newly-created engineering-development department, with the title of assistant chief engineer. D. F. Purdy, assistant chief engineer, will continue to supervise the drafting department.

Plant Improvements Begun By Cosden at Big Spring

BIG SPRING, Tex.—Beginning of an improvement program costing around $500,000 at the Big Spring refinery of Cosden Petroleum Corp. has been announced by R. L. Tollett, president. The projected alterations are expected to permit manufacture of competitive products in the first 5 years following the end of the Japanese war. Tollett said much work was being done to increase demand of the company's refinery products and to raise the volume of crude production, to permit the firm "to be relieved in part of our dependence upon distant markets and upon fluctuation in refinery product prices which usually precede related changes in crude oil prices."

Argentina Gets 200,000 Bbl. Of Fuel Oil Under Plan

BUENOS AIRES.—More than 200,000 bbl. (about 30,000 tons) of fuel oil already has been received by Argentina from the United States under the agreement effected early this year according to which Argentina gives linseed and other vegetable oils in return for the fuel oil.

No official statement has been made regarding the quantities of Ar-

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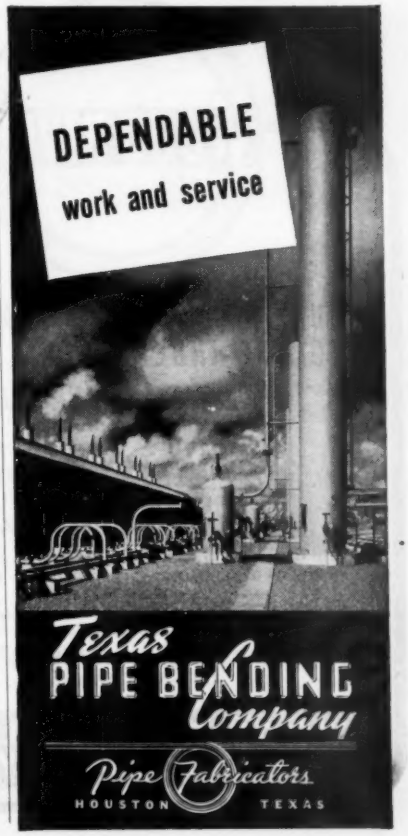

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gentine oils shipped, but it is assumed that their caloric value would be approximately the same as that of the fuel oil received. The agreement stipulated that deliveries by both countries should be maintained in virtually equal quantities on the basis of caloric values.

Isoprene-Recovery Plant Planned by Shell Union

LOS ANGELES.—Shell Union Oil Corp.'s chemical division will construct a $2,000,000 isoprene recovery and purification plant adjacent to the butadiene plant now operated by the company here for the Government's Rubber Reserve Co. Production capacity of isoprene for the Government is expected to be more than doubled by the new plant.

Worth Refining Bought by Great Lakes Petroleum

CHICAGO.—Great Lakes Petroleum Co., Chicago, has purchased Worth Refining Co.'s plant at Blue Island, Ill. Operation will continue without interruption and may be expanded later. The plant runs about 4,000 bbl. of crude daily, with capacity somewhat in excess of that figure.

Information on Controlling Chemical Hazards Offered

WASHINGTON.—A series of bulletins on "Controlling Chemical Hazards" is in course of preparation by the division of labor standards, U. S. Department of Labor, in cooperation with Manufacturing Chemists Association of the United States. Rapid growth of new chemicals and widening industrial use of well-known ones prompted the project, according to V. A. Zimmer, director of the division of labor standards.

The first bulletin, "Ammonia," is just off the press, and others to be issued cover chlorine, sulfuric and nitric acids, formaldehyde, and the anilines. There will be over 100 bulletins in the series. Each describes the hazards of the chemical, its characteristics, safety precautions for installation, handling and storage, protective clothing, permissible and hazardous concentrations, and first-aid treatment. A bibliography is included.

"Ammonia" will be of special interest to refrigeration and air-conditioning manufacturers, oil refineries, steel treatment and water-purification plants, manufacturers of sulfuric and nitric acids, fertilizer, drugs, and chemicals.

A supply of up to 25 copies will be sent without charge upon request by the division of labor standards, so long as the free supply lasts. Larger numbers may be obtained at 5 cents a copy from Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Interarea Shipment Report No Longer Required

CHICAGO.—E. J. Frueh, director of supply and transportation in District 2, Petroleum Administration for War, has advised original suppliers in the district that the weekly report on interarea shipments of oil products by truck is no longer necessary.

Work Started on First Oil Refinery in Mississippi

JACKSON.—Work has been started by Rogers Lacey, Longview, Tex., oil man, on construction of Mississippi's first oil refinery, at Haney, 2 miles north of Sandersville. The plant, which will refine Mississippi oil, is near both the Heidelberg and Eucutta fields. Construction is expected to be completed in about 4 months.

The refinery will have a daily capacity of 3,500 bbl.

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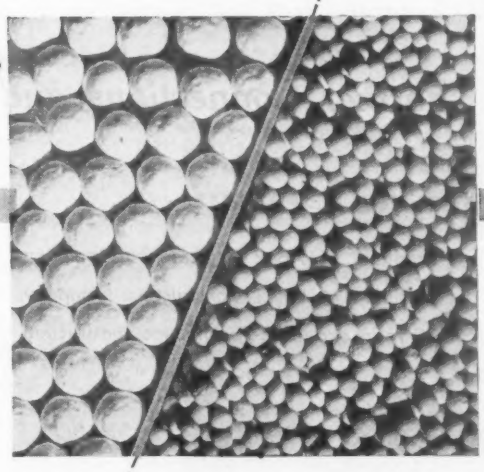

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Superintendent of Latex Construction Company, General Partner in Sharman and Allen, 17 years experience in pipeline construction.

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PIPE LINES

Two Gas Companies Seek To Increase Deliveries

WASHINGTON.—Natural Gas Pipe Line Co. of America and Texoma Natural Gas Co., operated as one business, with headquarters in Chicago, have made joint application for permission to construct and operate facilities designed to increase their delivery capacity 81,000,000 cu. ft. daily. The program involves estimated expenditure of $18,000,000 for pipe lines, compressors, and other equipment, of which the main items are:

Texoma Co.—Four 1,250-hp. engines at Station 22 in the Panhandle field, increasing the installed compressor capacity to 9,000 hp.; enlargement of dehydration and natural-gasoline plant facilities at Station 22; construction of 25.86 miles of 26-in. pipe line paralleling its present 24-in. line along the northerly portion of its transportation system.

Natural of America—Loops or additional sections of pipe line parallel to its original 24-in. line, totaling 286.48 miles of 26-in. line; 52.27 miles of 24-in. line on the northern end of the system; completion of a 20-in. line extending 19.75 miles north of Belvidere, Ill., by installation of two railroad crossings; construction of laterals.

Cities Service Planning to Expand Its Facilities

WASHINGTON. — Federal Power Commission has set August 7 as the date for a hearing on the application of Cities Service Gas Co. to install additional facilities to meet rising demand for domestic gas next winter, particularly in Kansas City, St. Joseph, and Sedalia, Mo.; Topeka and Lawrence, Kans.

Cities Service says the recent removal of restrictions against installation of gas-heating appliances, increase of population, and construction of new dwellings will so increase peak requirements as to necessitate enlargement of delivery capacity. The company proposes to spend $868,225 to make an additional 70,000,000 to 85,000,000 cu. ft. of natural gas available daily.

It is planned to construct (1) 32 miles of 20-in. gas loop pipe line from the company's North Welda, Kans., compressing station to its Ottawa, Kans., compressing station; (2) one dust scrubber at the North Welda station and two at the Ottawa station; (3) two used 485-hp. compressor units and appurtenant equipment at the North Welda station.

The company also wants to remove its Caney-American compressor station in Montgomery County, Kansas.

Cities Service transports natural gas produced in Texas, Oklahoma, Kansas, and Missouri and sells it for resale in Oklahoma, Kansas, Missouri, and Nebraska.

Chemical to Locate Submerged Line Breaks

The chemical compound, fluorescein, used by airmen forced down at sea to color the surface water around their rubber rafts and mark their locations, also played an important part, according to Science Service, in locating leaks in the pipe lines laid under the English Channel from England to France to supply Allies in Normandy with gasoline and oil.

United Seeks Permit For Suspension Bridge

The United Gas Pipe Line Co. of Shreveport has filed application with the U. S. engineer's office, at Vicksburg, Miss., for permit to erect a pipe-line suspension bridge, together with telephone line and aircraft warning light circuits, over Red River, in Red River Parish, according to announcement by Lt. Col. R. W. Sauer.

Plans for the proposed bridge are on file at the engineer's office.

The 24-in. pipe line, according to the plans, will be supported by a suspension bridge with towers on each bank of the river. The main span will be 1,600 ft. long and will have a vertical clearance of 56 ft. above high-water elevation.

European Military Lines Shipped 3,800,000 Gal. Daily

"At the peak of military operations in Europe, Army engineers pumped an average of 3,800,000 gal. of gasoline daily from ports in France and Belgium through three major pipe-line systems to the American Armies. The longest line in

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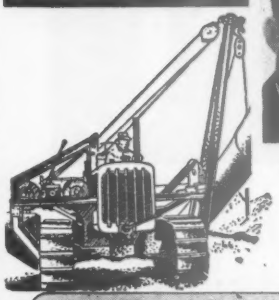

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each system extended across the Rhine River," according to Maj. Robert W. Harrison, engineer officer, who recently received the Legion of Merit for his work as executive officer of the Military Pipe Line Service in ETO.

"The three pipe-line systems included 2,380 miles of 6-in. and 1,440 miles of 4-in. pipe. The major system from Cherbourg to Mainz had a daily capacity in excess of 1,700,000 gal. The northern system from Antwerp to Wesel pumped more than 1,300,000 gal., while the southern pipe line, extending from Marseilles to Worms, carried over 700,000 gal. daily," reported Major Harrison, who is now on duty with the petroleum section, military operations, office of the Chief of Engineers.

Twenty engineer petroleum distribution companies including only 4,400 officers and men, operated these extensive pipe-line systems which handled the bulk of POL (petrol, oil and lubricants) delivered to the continent by the transportation corps.

Without the pipe line, 70,000 men operating 30,000 2½-ton cargo trucks would have been required to have handled the same volume of gasoline over the same distances in the form of packaged cargo, i.e. 5-gal. "jerricans." Transportation in bulk form would have required a minimum of 31,000 men and 13,000 semi-trailer 2,000-gal. tank trucks.

The greatest single problem facing the engineers who built the pipeline systems was transportation. Though a 500-mile 6-in. pipe line will pay for its own shipping weight every 7 days, the acute need at the front for the most critical items, including gasoline itself, sometimes made it impossible to allot transportation space to pipe, pumping stations or storage tanks.

The five major rivers which lay between Cherbourg and the Rhine were typical of the obstacles which had to be overcome by the construction crews. Some lines were laid over bridges; others had to be placed under water with the use of heavy, welded pipe.

Project Seeks to Give Gas To Northern Mexico

MEXICO CITY.—Plans for a $400,000 company to seek natural-gas production and construct a pipe line to move the gas to industries in northern Mexico have been submitted to the secretary of the national economy. The project would be wholly Mexican. The request is for permission to explore for gas in the states of Nuevo, Leon and Tamaulipas, within practical pipe-line distance of Monterrey, Mexico's manufacturing capital.

Legal Status of Memphis Project Is Disputed

E. Leland Richardson, attorney for the Louisiana Gas Conservation Commission, said last week that because of a stay order, he thought it doubtful that the Memphis Natural Gas Co. could proceed with construction of additional pipe lines in North Louisiana, pending disposition of the case before the U. S. Supreme Court.

Richardson said that an order by the U. S. Fifth Circuit Court of Appeals, which affirmed the court's stay order of May 21, 1945, "does not change the status of the case."

It was his opinion, Richardson said, that a certificate of convenience and necessity granted the company by the Federal Power Commission was superseded by the appellate court's stay order.

The Memphis company is seeking to transport additional natural gas from Louisiana fields for Tennessee consumption and is being opposed in the courts by the state on conservation grounds.

In the recent order the appellate court granted a motion by the company asking permission to proceed with construction "at its risk," but the court said its order applied "only to the extent of construing the stay order to be purely a stay order."

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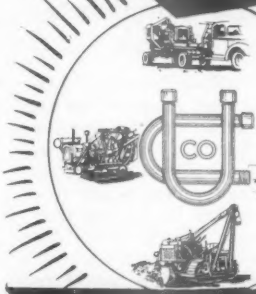

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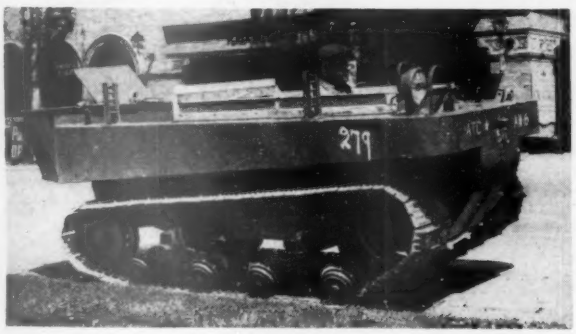

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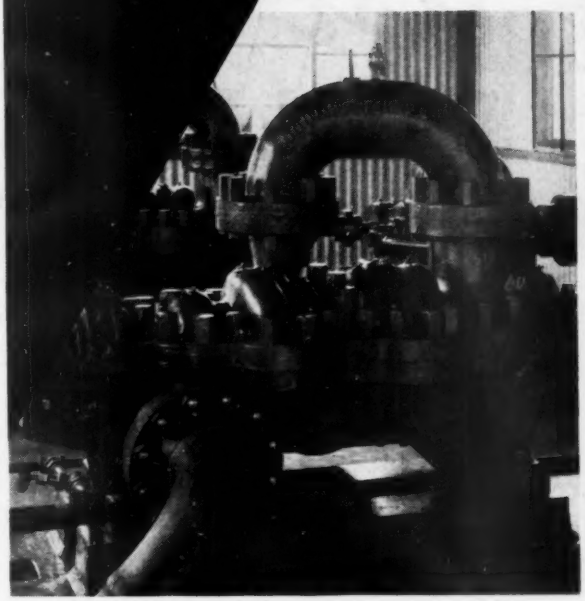

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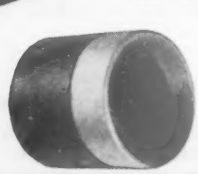

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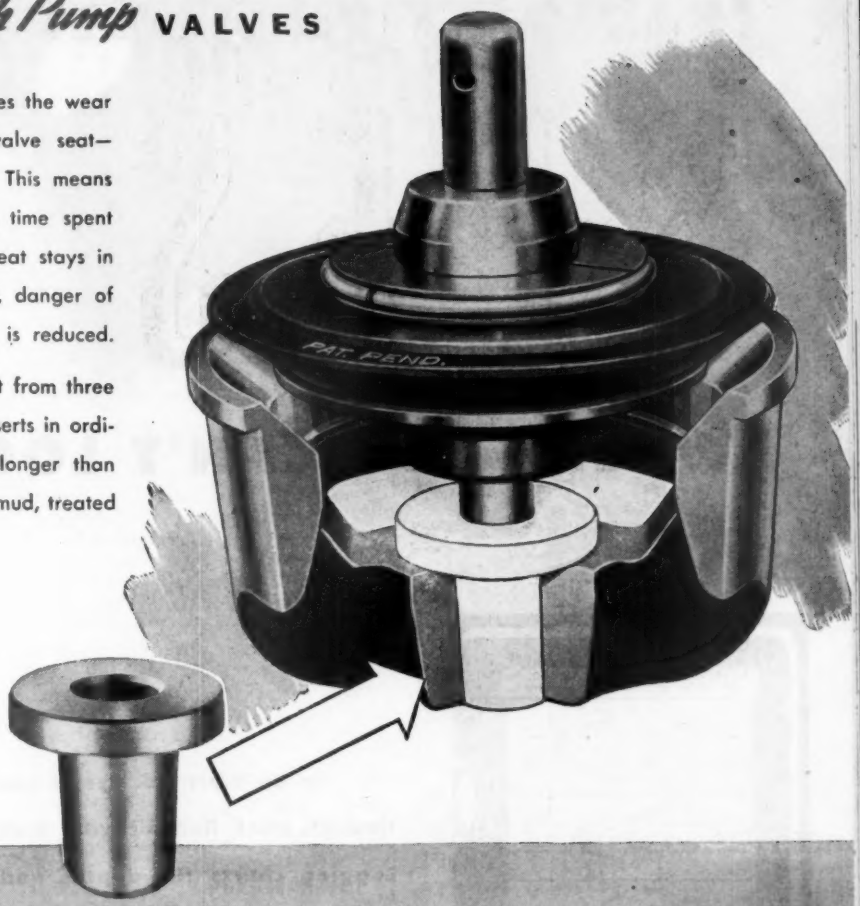

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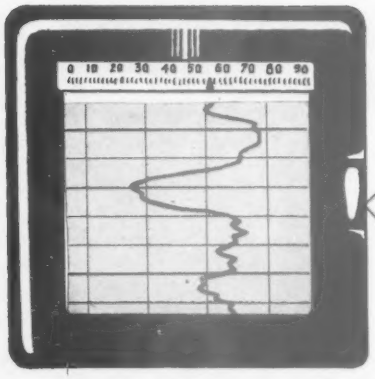

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Natural Gas

SEC Approves Proposed Sale of Gas Properties

PHILADELPHIA.—Securities and Exchange Commission has approved Southern Union Gas Co.'s proposed sale of its Oklahoma gas properties to Kingfisher Gas Co. for $237,000 and of its water properties in Kingfisher Water Co. for $70,000.

SEC also approved the proposed acquisition by E. R. Bahan, Walter J. Bahan, Merle A. Bahan, and William C. Bahan, of 20, 30, 30, and 20 per cent respectively of the voting securities in Kingfisher Gas Co., a new corporation to be created by the Bahans under the laws of Oklahoma. The Bahans are residents of Fort Worth, Tex., and Guthrie, Okla.

Southern Union will use the proceeds from the sales to retire $29,000 of its first-mortgage sinking-fund bonds due 1962.

Carbon-Black Production Exceeds Needs for July

WASHINGTON.—Carbon-black production for July is estimated at 102,800,000 lb., exceeding the month's requirements, which total 101,400,000 lb., according to War Production Board. All types of blacks are not available in sufficient volume to fill requirements, but substitute blacks are being obtained.

Production in August is estimated by producers at 101,900,000 lb. Total requests from industry for August amount to 95,100,000 lb.

The quantity of carbon black required for the rubber industry in the second quarter, as determined by the WPB requirements committee, was 268,400,000 lb. Actual second-quarter allocations totaled 263,100,000 lb. Stocks in the hands of consumers, as of May 1, amounted to 54,000,000 lb., and the deficit in allocations was made up by withdrawals from consumers' inventories. Production in the second quarter was 264,800,000 lb.

Estimated production of carbon black for the third quarter is 311,000,000 lb., compared with anticipated requirements of 312,900,000 lb. Consumers' stocks have remained at a high level, while stocks in the hands of producers increased 11,300,000 lb. in July. Total producers' stocks as of August 1 were estimated at 28,400,000 lb. WPB pointed out that stocks in the hands of producers and consumers are more than ample to take care of the small deficit shown in the third quarter.

Sohio to Provide Dow With Gas From Coldwater Field

MT. PLEASANT, Mich.—Sohio Petroleum Co. has entered into a contract with Dow Chemical Co., Midland, Mich., under which it is to sell the latter concern 3,000,000 to 5,000,000 cu. ft. of blended casinghead and dry gas from the Coldwater field, in Isabella County, daily. Work is to be started immediately on a $500,000 construction program, including a field plant to compress and desulfurize the casinghead gas, field-gathering lines and a 42-mile 6-in. main line from the field to Midland. The system is scheduled to be in operation by November 15.

Neither the casinghead gas produced at an average rate of 400 ft. per barrel of oil, or dry gas produced in the stray sand above the Dundee oil formation, is marketed at the present time in the 2,000-acre, semi-developed field.

Helium Production at Two Plants Is Suspended

WASHINGTON.—Operations have been suspended at the Cunningham, Kans., and Amarillo, Tex., helium plants, which are under the supervision of the Bureau of Mines. Output of the plants was devoted to war purposes.

"The decision to close the Amarillo plant temporarily and to dismantle the Cunningham plant was made on the basis of economy and in the interests of conservation of this noninflammable, light-weight gas," Harold L. Ickes, secretary of the interior, stated.

Elimination of the submarine menace in the Atlantic and improved conditions in the Pacific have lowered the demands for helium for the Navy's antisubmarine blimps and for other naval and military uses, and have made the continued operation of these plants unnecessary.

Current and future military needs, the secretary said, will be met by the Exell, Tex., and Otis, Kans., plants, both of which, constructed during the war, employ the most modern production methods. The Amarillo plant will be maintained in standby condition for immediate resumption of production on short notice, and will become the main headquarters for an expanding helium research program. The Cunningham plant is abandoned partly because of limited gas reserves in the area. Some of its personnel and equipment will be utilized in other helium plants and various war projects.

"During the height of the submarine warfare against the Axis," said Ickes, "it was necessary to produce large quantities of helium to help insure this nation's victory. The Cunningham plant definitely was a wartime expedient, constructed when war demands for helium were at a peak, and it has served its purpose well."

Congress has appropriated funds for helium utilization and research and this phase of operation will be continued at the cryogenic laboratory at Amarillo, with the entire program under the general direction of Dr. C. W. Seibel, supervising engineer of the Bureau of Mines helium plants. It is expected that the research work will involve the use of helium as a tracer gas in connection with studies of oil and gas reservoir conditions; shielded-arc welding; heat treatment of steels in an atmosphere of helium, and other uses applicable to operations at industrial plants.

Kansas-Colorado to Obtain Facilities in Two States

WASHINGTON. — Kansas-Colorado Utilities, Inc., of Lamar, Colo., has been authorized to acquire and operate natural-gas facilities of The Central Gas Utilities Co., of Abilene, Kans., located in Baca and Prowers counties, Colorado, and Stevens, Stanton, Hamilton, and Grant counties, Kansas. These facilities comprise Central's western division. Approximately $1,000,000 in cash is involved.

The facilities to be taken over include a pipe-line system of which the principal transmission line runs from a point in Stevens County, Kansas, northwest to a point near Johnson, Kans., and from there northwest to Lamar. From the point near Johnson another line runs southeast to Springfield, Colo. Other properties and facilities to be acquired are one wholly-owned gas well, an undivided one-half interest in four other gas wells, natural-gas and oil leaseholds and gathering facilities, all located in the Hugoton field, together with the distribution systems in the communities served, including Syracuse, Kans., Lamar and Springfield, Colo., and 12 smaller Kansas and Colorado communities.

XUM

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There is no record that any of the many thousands of Diamond Roller Chains in pumper service, installed in accordance with API Standard 11-E-1, have ever worn out.

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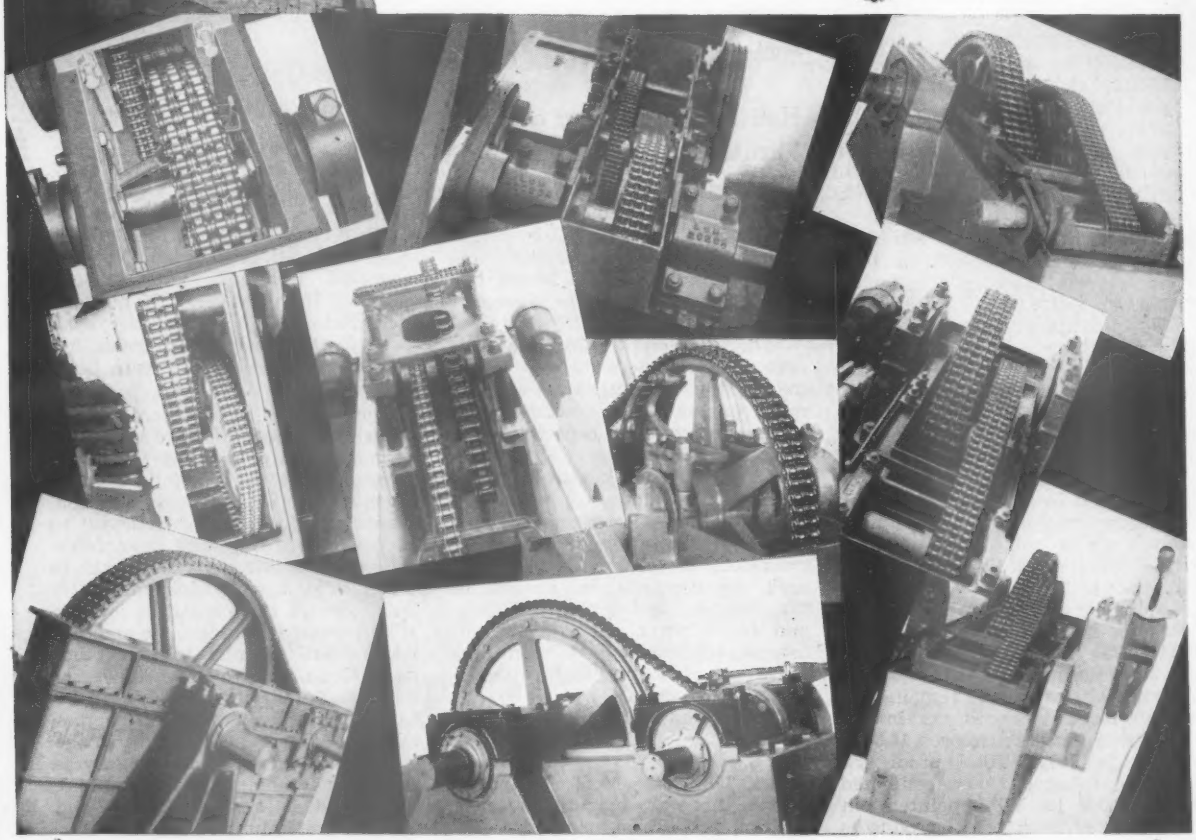


Exploration and Drilling

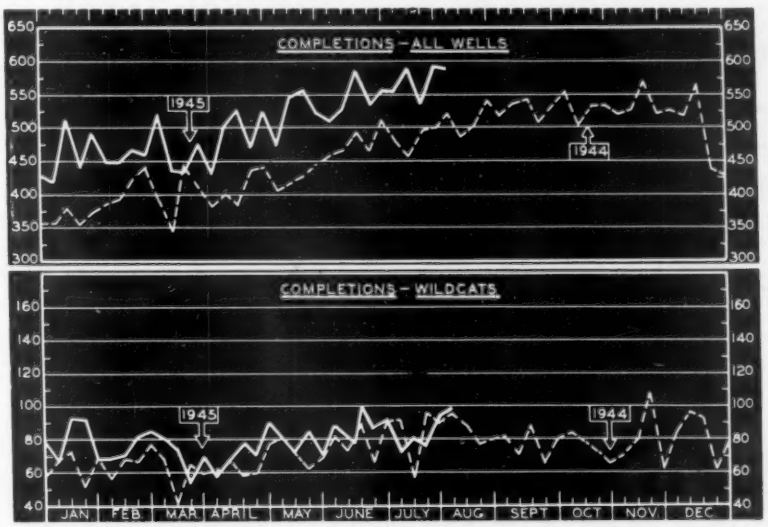
Week's Highlights

THE tristate area around the borders of Colorado-Kansas-Oklahoma is being watched very closely these days by the geologists and executives of many companies. Particularly keen interest is being displayed in the Pure Oil Co. ventures on the Keyes structure in Cimarron County, Oklahoma.

Pure's fourth test on this block, reported at 90,000 acres, has swabbed 7½ bbl. of oil in 10 hours from a pay in the basal Pennsylvanian. This test, 1 Oklahoma State, SE SE NW 7-5n-8ecm, found pay at 4,786-90 ft. Rotary was moved off and a cable-tool unit moved in. Cleanout operations are now under way preparatory to shooting.

It is this oil showing against the background of the other tests that gives it special significance. Pure's first test, 1 Cox, SE SW 16-5n-8ecm, was completed in May, 1943, as a 19,000,000 cu. ft. gas well from basal Pennsylvanian at 4,670-4,750 ft., after plugging back from total depth of 6,280 ft. The second test, 1 Rose, SE NE SW 26-5n-8ecm, was completed last February as a 14,000,000 cu. ft. gas well from same pay at 4,640-75 ft., after plugging back from 5,550 ft., where it was believed to be in the Arbuckle. The third test, 1 Alliance Insurance Co., NE NE NE 9-5n-7ecm, had a slight show of gas at 4,790-96 ft., and was dry at 4,972 ft., total depth.

The block is known to be on a gravimeter high, and has probably been seismographed. All the wells show up regionally high. With 4 wells completed, over an area ap-



Solid line charts current weekly completions, service wells in Eastern area included

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 4, 1945

	Total of all wells					Cum. to date		Wildcat completions and discoveries					Cumulative total, 1945				
	Comp.	Oil	Gas	Dry	Footage	1945	1944	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	36	18	0	*18	54,110	823	946	0	0	0	0	0	0	0	0	0	0
Pennsylvania	102	46	17	†39	174,738	2,391	2,296	0	0	0	0	0	0	0	0	0	0
West Virginia	16	2	13	1	50,553	482	518	0	0	0	0	0	0	0	0	0	0
Ohio	25	7	9	9	58,264	539	567	0	0	0	2	2	0	0	11	39	50
Indiana	9	4	0	5	18,537	115	127	1	0	0	3	4	5	0	0	18	23
Kentucky	23	9	7	7	43,199	282	403	0	0	0	3	3	16	0	2	28	46
Illinois	46	19	0	‡27	126,876	999	1,050	1	0	0	10	11	27	0	0	181	208
Michigan	26	11	2	13	60,347	452	364	0	0	0	8	8	5	0	2	157	164
Kansas	38	11	3	24	128,584	984	1,050	0	0	1	10	11	22	0	10	206	238
Neb., Mo., Iowa	0	0	0	0	0	12	19	0	0	0	0	0	0	0	0	9	9
Oklahoma	45	16	5	24	154,649	1,425	1,000	2	0	2	9	13	53	2	11	207	273
Texas	122	64	18	40	572,700	4,247	3,166	0	1	1	24	26	133	12	36	764	945
North Central	38	22	0	16	97,002	1,270	847	0	0	0	8	8	51	0	5	275	331
West	20	17	1	2	101,321	1,086	883	0	0	0	2	2	37	1	0	160	198
Panhandle	16	7	8	1	50,101	332	128	0	0	0	0	0	0	0	1	4	5
Eastern	6	1	5	0	40,884	195	195	0	1	0	0	1	5	6	1	52	64
Gulf Coast	34	17	4	13	252,375	968	686	0	0	1	9	10	28	4	23	164	219
Southwest	8	0	0	8	31,017	396	427	0	0	0	5	5	12	1	6	109	128
Louisiana	19	13	0	6	160,694	597	454	1	0	0	2	3	21	3	4	76	104
Northern	2	1	0	1	9,775	213	171	0	0	0	1	1	6	1	4	44	55
Southern	17	12	0	5	150,919	384	283	1	0	0	1	2	15	2	0	32	49
Arkansas	3	1	0	2	12,036	105	128	0	0	0	1	1	0	0	0	28	28
Mississippi	8	4	0	4	60,393	210	80	0	0	0	2	2	3	0	0	67	70
Southeastern States	2	0	0	2	8,734	37	21	0	0	0	2	2	0	0	1	25	26
Montana	2	2	0	0	5,489	183	188	0	0	0	0	0	7	0	0	12	19
Wyoming	5	4	0	1	18,881	117	94	0	0	0	0	0	9	0	0	22	31
Colorado	0	0	0	0	0	22	18	0	0	0	0	0	1	0	1	3	5
New Mexico	12	7	1	4	39,073	262	227	0	0	0	2	2	8	0	3	36	47
California	50	38	0	12	180,859	1,390	1,166	1	0	0	10	11	2	0	2	139	143
Total United States	589	276	75	238	1,928,716	15,674	13,882	6	1	4	88	99	312	17	83	2,017	2,429
Total previous week	596	315	50	231	1,931,768	15,085	13,337	15	0	2	77	94	306	16	79	1,929	2,330
Total August 5, 1944	520	254	42	224	1,516,887	13,882	9,896	7	0	3	86	96	244	20	72	1,869	2,205

Service wells included: *18, †38, ‡1.

XUM

proximately 8 miles east and west by 4 miles north and south, interpretation of the geophysical picture should be getting more accurate. With two gas wells, one dry hole and one well that may indicate the edge of oil saturation, or make a producer, any commercial oil present ought to be just about pinned down.

This county has not been without its believers in the past. Ever since the Ramsey well in 27-5n-5ecm had a good show of oil 20 years ago, a certain amount of activity has continued, sometimes at long intervals. All told, exclusive of Pure's recent activity, at least 15 wildcats have been drilled in Cimarron County, but most of them have been west of the current activity.

EASTERN TEXAS

New Woodbine Test for Southwest Rusk County

DALLAS.—G. F. McMillan and McNathan 1 M. & R. Kangerga is a new Woodbine sand wildcat for southwestern Rusk County. It is in the Thomas Wood Survey, 5 miles north of New Salem. Bobby Manziel 1-A Shamburger, J. M. Rogers Survey, in the Merigale pool of northern Wood County, which ran wild 2 weeks ago is flowing into pits to clean out. The test has not been completed. 1,250 ft. southwest of this test and in the same survey, 1-B Shamburger has been spudded.

Magnolia Petroleum Co. 1 W. L. Harrell, wildcat 2½ miles southeast of Waterman, Nacogdoches County, ran a drill-stem test at total depth of 4,350 ft. and recovered salt water only. It was drilling below 4,734 ft. after setting mid-string of casing at 4,665 ft. Humble Oil & Refining Co. 1 Spigner, Pickton pool of southern Hopkins County, gaged 63 bbl. of fluid, 5 per cent salt water in 24 hours at total depth of 7,950 ft.

The Carthage field, Panola County, had 2 completions this week. The Pickton field, Hopkins County, had 3 new locations, while the Carthage field had 2.

EASTERN TEXAS SUCCESSFUL WILDCAT

Harrison County: New Gas-Distillate pool —D. E. & R. J. Whelan 1 Wm. Peel est., Betty Humphrey Sur., 2½ mi. NW Harleton, flowed 52,000,000 cu. ft. gas through ½-in. choke, perf. 6,776-94 ft. Rodessa, with 10.75 bbl. 58.9-gravity distillate per million cu. ft. gas, gas-oil ratio 100,000, TD 7,864 ft.

N. CENTRAL TEXAS

New Bend Pool Opened In Southeast Jack County

WICHITA FALLS.—Roeser & Pendleton, Inc., and F. Kirk Johnson 1 McAnally, ½ mile northeast of Joplin and 3 miles east of the Risch pool, opened a new Bend conglomerate pool in southeastern Jack County. A 30-minute drill-stem test was run from 4,407-46 ft., total depth. There was a continuous blow of gas during the test and 250 ft. of oil and 535 ft. of heavily oil-cut mud was recovered. Casing was being run. Continental Oil Co. 2 Hooten, south of the discovery well in the Risch pool, was drilling below 3,746 ft. in hard sand and shale.

Fain & McGaha 1 Pace and Strange, A. Rohus Survey, is the second producer for the new Prideaux Strawn pool of northeastern Young County. The well flowed 133 bbl. of 42° gravity oil in 12 hours through 20/64-in. choke. Total depth is 3,609 ft. The Texas Co. 1 F. & M. Trust Co., W&NW Survey, a wildcat 5 miles northwest of Childress in Childress County, was drilling below 7,152 ft. in lime. Humble Oil & Refining Co. 1 Halsell, H&TC Survey, a wildcat 10 miles southwest of Thalia in Foard County, was drilling below 5,025 ft. in shale with lime streaks.

The KMA field, Wichita County, and the Ellis & Dubose field, Jack County, each had 3 completions this week. Archer County had 7 new field locations and Wichita and Young counties each had 5.

In West Central Texas, Stephens County reported 2 field completions and Shackelford County 1. Jones County Regular field, and the Reddin field, Taylor County, each reported 2 new locations.

NORTH CENTRAL TEXAS WILDCAT FAILURES

Archer County: Wayne King 1 W. S. Hale, Blk. 95, J. W. Harris Subd. Club Ranch, 5 mi. W and ½ mi. S Archer City, dry, TD 1,469 ft.

Cooke County: J. W. Baldwin 1 J. F. Bugg, DeMarcus Sur., 2½ mi. N and 1½ mi. E Woodbine, elev. 817 ft., dry, TD 2,583 ft.

R. H. Lynn 1 John Bayer, John Barnett Sur. A-42, 1 mi. S Muenster, elev. 1,003 ft., dry, TD 1,752 ft.

Wichita County: Akin & Dimock 1-A W. B. Honaker, James Cole Sur. A-37, 7 mi. W and ½ mi. S Clara, dry, TD 2,079 ft.

D. D. Feldman 1 D. D. Feldman, Sec. 15, Blk. 7, H&TC Sur., 11 mi. S and ½ mi. W Electra, dry, TD 2,030 ft.

Young County: R. V. Tidwell 1 D. M. Baker, Henry Hodges Sur. A-134, 3 mi. SE Murray, elev. 1,227 ft., Caddo 3,576 ft., dry, TD 3,644 ft.

WEST CENTRAL TEXAS WILDCAT FAILURES

Comanche County: Central Texas Drlg. 1 W. C. Pettit, L. Pumpin Sur., 1 mi. SW Energy, elev. 1,357 ft., Marble Falls 2,704 ft., Ellensburger 3,166 ft., dry, TD 3,454 ft.

Shackelford County: Hickock & Reynolds 1 Merrick Davis, Sec. 21, Blk. 12, T&P Sur., 8 mi. SW Albany, elev. 1,925 ft., dry in Swastika, TD 1,920 ft.

Taylor County: West Central Drlg. 1 N. D. Teaff, Jose Gabo Sur. No. 128, 1½ mi. W Tye, elev. 1,811 ft., Saddle Creek 2,292 ft., Flippen 2,360 ft., dry, TD 2,384 ft.

DAILY AVERAGE PRODUCTION FOR WEEK

	Aug. 4 crude oil	Distillate, allied products	August PAW quota all oils	July 28 crude oil
Alabama	950	.....	500	1,000
Arkansas	80,050	5,400	85,400	79,550
California	942,250	60,900	1,012,900	946,150
Colorado	11,800		12,000	12,000
Eastern	63,250	6,300	71,500	63,800
Florida	200			250
Illinois	204,000	12,000	212,000	199,900
Indiana	13,700	.....	13,000	13,500
Kansas	257,550	4,500	278,500	278,450
Kentucky	29,300	2,600	30,600	29,700
Louisiana	366,200	42,000	402,000	367,300
North Louisiana	70,500	.....	.....	70,400
South Louisiana	295,700	.....	.....	296,900
Michigan	47,750	800	47,800	47,700
Mississippi	52,750	.....	53,000	51,650
Montana	23,600	300	22,300	23,700
Nebraska	850	.....	1,000	850
New Mexico	103,550	6,800	111,800	104,100
Oklahoma	390,850	28,000	408,000	390,400
Texas	2,222,700	166,000	2,356,000	2,209,400
East Texas	380,900	.....	.....	379,500
East Central Texas	145,600	.....	.....	139,000
North Central Texas	152,850	.....	.....	152,300
Texas Panhandle	88,000	.....	.....	87,500
West Texas	526,650	.....	.....	521,400
Southwest Texas	361,100	.....	.....	360,750
Texas Gulf Coast	567,600	.....	.....	568,950
Wyoming	108,300	3,500	121,700	108,800
Total United States	4,919,600	339,100	5,240,000	4,928,200
Change from previous week	down 8,600			

Total production January 1-August 4, 1945 ..... 1,040,467,800 bbl.
Same period last year ..... 938,468,500 bbl.

CALIFORNIA

New Field Opened Up S. E. Of Midway-Sunset

LOS ANGELES.—Western Gulf 2 U.S.L. Woodward, in 21-11n-23w, Santiago district, Kern County, 2 miles southeast of the Sunset area of Midway-Sunset field, flowed 520 bbl. of 23.6° gravity oil with 192,000 cu. ft. of gas in 12 hours through a 32/64-in. choke, from pay at 2,460-72 ft., in the Leutholtz sand within the Stevens member of Miocene age.

The area around the new discovery is easily accessible over paved roads, and although the acreage surrounding is held in large blocks, the shallow depth will probably result in rapid testing of the possibilities.

None of the deep wells under way in California had any outstanding developments during the past week. At Long Beach, Shell Oil Co., Inc., 48-A Alamitos is drilling at 13,149 ft., having made 70 ft. of hole in the last week, while Shell's 1 Stakemiller-Rose is at 12,127 ft., after making 116 ft. last week. Both are drilling in hard, sandy shale. In Ventura Avenue, one of the most important tests in California, Tide Water Associated Co. 21 McGonigle is drilling at 11,592 ft., after swabbing water on a formation test at 10,960-75 ft. At Rincon, Chanslor Canfield Midway Oil Co. 11-C Hobson is spot coring at 12,291 ft., and will probably continue drilling. This field should show deeper production, but to date several deep

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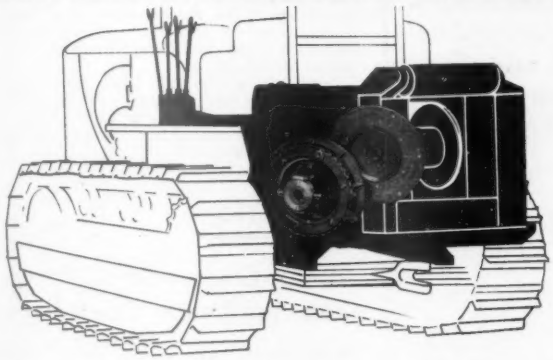

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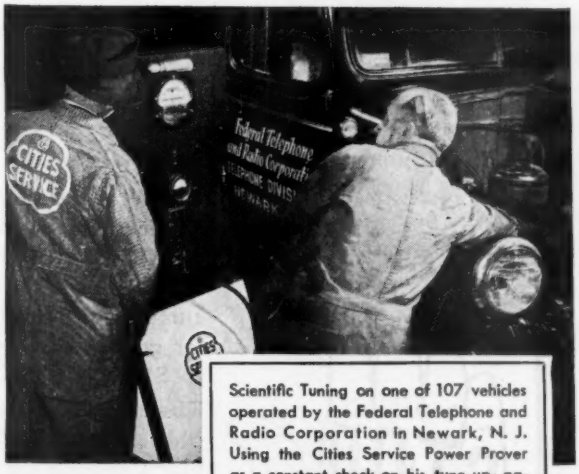

Scientific Tuning on one of 107 vehicles operated by the Federal Telephone and Radio Corporation in Newark, N. J. Using the Cities Service Power Prover as a constant check on his tune-up, garage foreman Teddy Baldwin was able to reduce gasolene waste from 28% to 11%.

"I always prove the efficiency of my fleet"—says Mr. Bell, superintendent for the Federal Telephone and Radio Corporation in Newark, N. J., a subsidiary of I. T. & T. "When I first came to work here, I tried out the Cities Service Power Prover on the whole fleet of 107 cars. Believe it or not, by the end of the month it helped us save more than 520 gallons of gasolene . . . reduced oil dilution . . . gave us better engine performance with fewer breakdowns. Now we use it regularly for quick, accurate tune-up."

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holes have all been failures. In the Fillmore district of Ventura County, Standard Oil Co. 1 Elkins, in 6-3n-19w, is drilling at 11,659 ft., with no major showings logged to date. Tide Water Associated's Cantua wildcat in 15-17s-15e is drilling below 11,100 ft. This test had to use heavy mud to keep gas pressure under control in the Domengine at 10,073 ft. At Lost Hills, Standard got a high head water flow at 11,080 ft., after losing circulation around 10,000 ft., but is preparing to drill ahead. The cavity in this test took over a ton of bulky material.

Locations were made for 50 new wells during the past week, as compared to 50 completions recorded. One of the new locations was an offset by Richfield to Western Gulf's new wildcat completion.

CALIFORNIA SUCCESSFUL WILDCAT

Kern County, Santiago District: Western Gulf 2 U.S.L.-Woodward, 21-11n-23w, flowed 1,000 bbl. clean 23.6°-gravity oil, 192,000 cu. ft. gas, 32/64-in. bean, TD 2,678 ft., Leutholtz sand within Stevens member of Miocene age, oil sand 2,460-72 ft., opens up new productive area southeast of Sunset area, nearest production about 2 miles.

CALIFORNIA WILDCAT FAILURES

Kern County, Antelope Hills: Miller & York, 1 Theta 12-28s-19e, bottomed in hard gray sand, dry, TD 2,043 ft.

Ant Hill: Amerada 58-23 S.P., 23-29s-29e, bottomed in basement schist, Olcese 3,318 ft., Pyramid Hills sand 4,187 ft., top schist 5,317 ft., dry, TD 5,382 ft.

Round Mountain: T. P. Pike Drilling Co. 1 Jewett, 19-28s-29e, bottomed in gray sand grit zone 2,131 ft., Vedder zone Miocene age 2,143 ft., dry, TD 2,158 ft.

Los Angeles County, Covina: Texas 5-1 South Covina Comm., 18-1s-9w, bottomed in gray sand, ran electric log and sidewall sampled, no showings, TD 2,000 ft.

Newhall: Anderson & Palmet, 1 Newhall, 11-3n-16w, bottomed in gray sand, only minor showings, dry, TD 4,726 ft.

Pico: Rothschild Oil Co. 1 Cates, 7-2s-11w, bottomed in gray sand, only minor showings logged, dry, TD 4,195 ft.

San Bernardino County, Chino: Municipal Oil Co., 1 Mahala 13-3s-7w, bottomed in gray oil sand, showings failed to sustain production, dry, TD 3,001 ft.

Santa Barbara County, Elwood: Union 1 Campbell Ranch, 24-4n-29w, bottomed in gray Sespe sand, ran electric log and dipmeter to 5,053 ft., cored to bottom, dry, TD 5,076 ft.

Los Alamos: Whittier Associates 1 Glenn Buell, 15-7n-32w, bottomed in hard gray sand, no showings, dry, TD 1,787 ft.

Solano County, Montezuma: Standard 1 Montezuma Comm., 20-4n-2e, bottomed in hard gray sand, only minor showings logged, dry, TD 7,400 ft.

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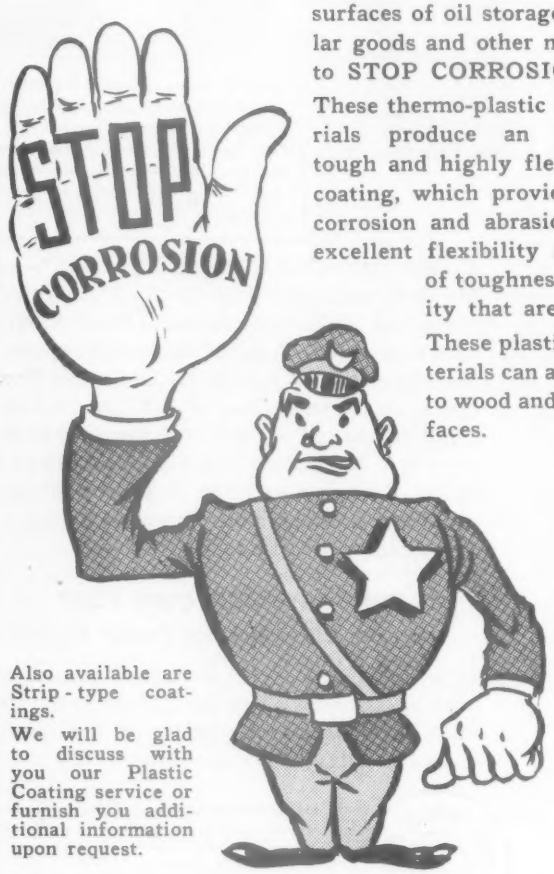

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CANADIAN FIELDS

Trenton Lime Exploration Campaign for Ontario

CHATHAM.--Imperial Oil Co. has announced plans for a systematic testing of the Trenton Lime in southwestern Ontario. Although this formation is productive south of Lake Erie, it has never been systematically tested in Ontario, although it underlies the province west of a line from Collingwood on Georgian Bay to near Toronto on Lake Ontario.

The company has leased approximately 80,000 acres and is planning 25 wells for 1945 with others to follow in 1946. Two tests are already drilling and 2 others are rigging up. Drilling is underway in the Rondeau area in Kent County, and near Rodney, in Elgin County; while tests are starting at Dubuque, Dover Township, and in Orford Township, Kent County, south of Moraviantown.

Prince Edward Island.—Socony-Vacuum and Cities Service Co. joint test, 1 Island Development, in Hillsborough Bay, more than a mile off Governor's Island, is reported nearing the Canadian depth record of 12,955 ft.

Conrad.—Two 50-bbl. wells have been completed by the California-Standard Co. in the Conrad field, southern Alberta. These are 13-5-A, LSD 8, 5-16-15w4, and 35-5-A, LSD 10, 5-6-15w4.

ILLINOIS

Albion Consolidated Pool Gets Southwest Extension

CENTRALIA.—The Albion Consolidated pool was extended about 1 mile southwest when Fred A. Noah & Sons 1 Kershaw, NE NW NW 14-3s-10e, made 100 bbl. natural from the Biehl (Pennsylvanian) sand at 1,989-96 ft. The well was then shot with 20 quarts, and after cleaning out, was rated at 200 bbl. Three offsets were started immediately.

Kingwood Oil Co. 1 Fulk, SE SE SW 13-5n-7e, Clay County wildcat, swabbed 15 bbl. of oil in 15 hours from the Cypress at 2,563-77 ft., and is still testing. Carter Oil Co. 1A Providence Mutual, NW NW SE 14-4s-7e, Hamilton County test, is waiting on cement, with casing set at 3,287 ft., in top of the Aux Vases sand. C. A. Lynch et al 1 Richardson, Jefferson County, topped the St. Genevieve at 2,716 ft., is now drilling at 2,810 ft., and is reported about ready for abandonment. Mohawk Drilling Co. 1 McDaniel, Wayne County wildcat, topped the Aux Vases at 3,141 ft., had a slight show of oil, cored 3,147-53 ft., and found salt water.

Completions this week totaled 46, of

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which 19 were producers and 27 dry, including 1 successful wildcat and 10 wildcat failures. Average initial production of the producers was 113 bbl., slightly better than last week's 100 bbl. average. A 411 bbl. and a 234 bbl. initial respectively from 2 wells in the Clay City Consolidated pool were the best of the week. There were 43 permits issued this week. Wayne County leading with 9, followed by Jefferson 7, Edwards 5, Clay 4, Effingham, Marion and Wabash 3 each, White 2, and the balance scattered.

ILLINOIS SUCCESSFUL WILDCAT

Gallatin County: Extension to Herald Pool —Frank King, Jr. 1 Jones, NE NE NE 22-7s-9e, 200 bbl. in 24 hours from 2,899-2,906 ft., TD 2,913 ft.

ILLINOIS WILDCAT FAILURES

Clinton County: Texas 1 Schafer "C," SW NW SW 26-3n-2w, dry, TD 1,498 ft., St. Louis 1,490 ft.

Effingham County: Reward Oil 1 Counts, SE SW NE 30-6n-7e, dry, TD 2,923 ft., McCloskey 2,873 ft.

Fayette County: Dale Hopkins 1 Myers, SE SE SW 25-8n-3e, dry, TD 1,811 ft., St. Genevieve 1,806 ft.

Franklin County: Skelly 1 Merkel, NE NW SE 3-5s-1e, dry, TD 2,952 ft., St. Louis 2,950 ft.

Bell & Zoller 5 Zeigler Coal and Coke, NW NW NE 25-7s-1e, dry, TD 2,853 ft., McCloskey 2,803 ft.

Jasper County: John Washburn et al 1 Baker, NE NW SE 30-6n-10e, dry, TD 2,954 ft.

Jefferson County: Cherry & Kidd 1 Carson, NE NE SW 31-3s-3e, dry, TD 2,947 ft., St. Louis 2,922 ft.

Marion County: Buell & Doran 1 Sloan, NW NW SE 1-2n-1e, dry, TD 2,160 ft., McCloskey 2,124 ft.

Wabash County: Central Pipe Line 1 Mundy, SW NE NW 32-1n-13w, dry, TD 2,890 ft., St. Louis 2,887 ft.

Wayne County: Edmiston Drilling 1 Askvig, SW NW NE 10-3s-6e, dry, TD 3,400 ft.

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APPALACHIAN FIELD

New Work Picks Up in West Virginia

PITTSBURGH.—The past week saw 33 new locations announced in West Virginia compared to 16 completions. Boone County led with 7 new locations, and there were 5 in Lincoln County, while Clay, Kanawha, Logan, Marshall, Ritchie, Wayne, and Wyoming had 2 each, and Calhoun, Marion, Mingo, Monongalia, Pleasants, and Wetzel had 1 each.

In the Logan district, Logan County, Columbia Carbon Co. 801 Island Creek Coal Co., a semi-wildcat, after acidizing, gaged 7,145,000 cu. ft., from total depth of 2,000 ft. in the Big Lime.

Southwestern Pennsylvania had 10 new locations compared to 11 completions. New locations were in Armstrong, Clarion, Greene, Indiana, Jefferson, Washington, and Westmoreland counties.

The Texas Co. test on J. P. Walker farm, Robinson Township, Washington County, is drilling 144 ft. below the top of the Onondaga lime and should reach the Oriskany soon. This test had a show of 19,000 cu. ft. of gas in the top of the Onondaga. Manufacturers Light & Heat Co. test on the M. L. Polen farm, Center Township, Greene County, made 993,000 cu. ft. of gas from the Bayard Stray sand, topped at 3,484 ft., total depth 3,500 ft.

In Ohio, the Ohio Oil Co. test on the Warren Waring farm in Section 13, Smith Township, Mahoning County, drilled through the Oriskany and had only 10,000 cu. ft. of gas and a show of oil in top of sand. This test is aout 6 miles north of the new Oriskany development in Knox Township, Columbiana County. It will probably be deepened to the Clinton sand.

ROCKY MOUNTAIN

Important Wildcats Started in Rocky Mt.

DENVER.—Something like a record was made in the Rocky Mountain area this week with 22 new operations reported, of which 10 are wildcats. Most of the wildcats will be drilled by major companies and are scattered from northern New Mexico to northern Montana. With a few exceptions these are deep tests, located after unusually intensive study of the geology and the use of geophysical methods.

A particularly important test will be drilled by General Petroleum Corp. on Piceance Creek, in Rio Blanco County, Colo., in its No. 84-15-G, SE SE NE 15-2s-96w, 40 miles southeast of the Rangely field. The structure is comparable to Rangely in area, but the horizons to be tested are much younger. Magnolia Petroleum Co. drilled 3 gas wells here years ago which made from 2,000,000 to 8,000,000 cu. ft. per day from the Green River formation at around 3,000 ft. The gas in one of these wells was especially wet. How deep the new test will go is not reported. The Dakota sand is estimated at 15,000 ft., but numerous shallower sands are believed to exist in the Wasatch, Mesa Verde and Mancos formations.

Two wildcats will be drilled in Weld

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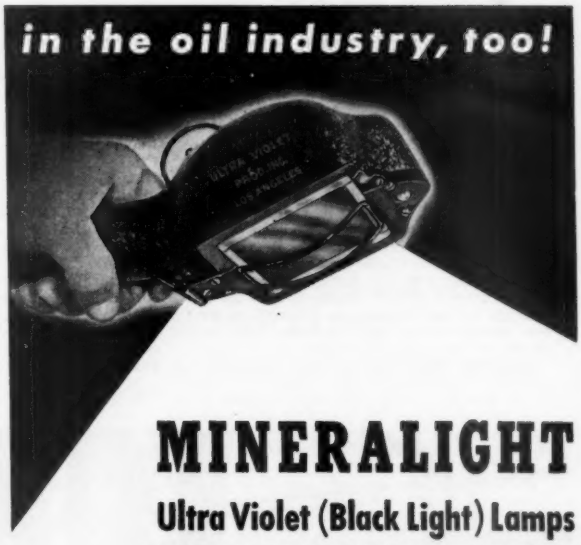

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County, Colorado. Ohio Oil Co. is reported to have made a location in NW SW SW 1-3n-61w, to be drilled jointly with Associated Oil Co. The block includes 47,000 acres, 25,000 in Weld County and 22,000 in Morgan County. It probably will go to around 8,000 ft. The other will be on the Johnstown structure in 22-5n-67w. Frontier Refining Co., unit operator for a joint operation with Phillips Petroleum Co., Kerlyn Oil Co., and Union Pacific Railroad Co. has requested bids for drilling to about 8,300 ft. to test the Sundance. Continental Oil Co. 1 Shiprock Dyke, 5 miles south of the Rattlesnake field, San Juan County, New Mexico, on unsurveyed land, is 6,270 ft. south and 10,890 ft. west of SW corner 31-29n-18w. It will go to the Dakota at 1,300 ft. to test the theory of a fault closure near the Shiprock dyke on the west.

Mountain Fuel Supply Co., NE SE 12-15s-11e, on the Farnham dome, Carbon County, Utah, will go to the Weber at around 6,000 ft. It is one-half mile east of a well drilled in 1924 by Utah Oil Refining Co. which had 2,000,000 cu. ft. of carbon dioxide gas in the Morrison sand at 3,235 ft.

Texas Co. is moving in rotary for 1 Leonard, NW SE NW 15-33n-4e, Liberty County, Montana, to go to the Devonian. It is ½ mile east of a small Madison lime oil discovery made in 1943, and west of 1 Laas which made 25,000,000 cu. ft. at 2,610 ft., but was completed in the Madison at 2,346-49 ft. for 3,000,000 cu. ft. per day.

General Petroleum Corp. is moving in for its test, 38-3-G in 3-25n-8w, Teton County, Montana, where it has a large block upon which extensive geological work has been done during the past year.

Other wildcats include Marcus Snyder 1 Buzzetteri-Cortins, Lot 3, 24-1s-32e, west of the Hardin shallow gas field, Big Horn County, Montana; McKinley Oil Corp., 1, NE NW 7-34n-61w, Las Animas County, Colo., and North Conrad Syndicate 1 Yeager, SE NW NE 24-30n-3w, Pondera district, Montana.

Completions.—Completions for the week were down to 7, all development wells, of which 6 were oil wells with an initial production of 2,752 bbl., and 1 was a dry hole. These were distributed one each at Gebo, East Lance Creek, Elk Basin, Shoshone and Hamilton in Wyoming and 1 each in Cut Bank and High Gravity in Montana. Best well was Continental 7 Gebo for 1,884 bbl. in the Gebo field.

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SOUTHWEST TEXAS

New Condensate Discovery For Willacy County

CORPUS CHRISTI. — A new condensate pool, 3 miles southwest of Raymondville, Willacy County, has been opened by Magnolia Petroleum Co. and J. S. Abercrombie Co. 1 H. H. Dohe, in San Juan Carricitos Grant. On a 4-hour gage it flowed at the rate of 138 bbl. per day of condensate through a 19/64-in. choke, tubing pressure 1,800 lb., gravity 52.5°, with gas-oil ratio of 31,000 to 1. Tests on various chokes are being continued. The perforations are at 10,000-10,040 ft., total depth 10,560 ft., 7-in. casing at 10,015 ft., and 5-in. liner set to bottom. This well is about 6 miles southeast of Shell Oil Co.'s old abandoned producer completed several years ago, and carried under the field name of "La Sal Vieja."

Calatexia Oil Co. 1 S. E. McKnight, wildcat in Section 35, Block 13, 4½ miles southwest of Carrizo Springs in Dimmit County, flowed an estimated 500,000 cu. ft. of gas per day through a ¼-in. choke, with 325 lb. working pressure. Production is from 24 perforations at 2,640-45 ft.

LaGloria Corp. 2 South Weslaco Unit, 6 miles south of Weslaco, in the Lana Grande Grant, Hidalgo County, made a triple completion gas well from the Key, Fawsek, and Turner sands. From 80 perforations at 7,390-7,410 ft. (Key) it flowed an estimated 15,500,000 cu. ft. of gas per day, open flow, shut-in pressure 3,100 lb. From 180 perforations at 8,882-8,920 ft. (Fawsek) it made 11,800,000 cu. ft. gas per day, open flow, shut-in pressure 3,500 lb., and from 200 perforations at 9,020-60 ft. (Turner) it flowed 18,300,000 cu. ft. of gas per day, open flow, shut-in pressure 4,300 lb.

Gulf Oil Corp. 1 Emma Tartt et al, wildcat, 14 miles southwest of Hobson field in the James Wilkinson Survey, Abstract 882, Atascosa County, was abandoned at total depth of 6,632 ft.

Humble Oil and Refining Co. 1-D Mestina Oil & Gas Co., wildcat 12 miles southeast of Hebbronville, Jose I. Salinas Survey, Jim Hogg County, was abandoned at total depth of 10,460 ft.

W. W. Zimmerman 1 F. W. Seabury, wildcat, 12 miles north of Rio Grande City, Porcion 79, Starr County, recorded sand at 3,921-35 ft. On a 5-minute drillstem test at 3,929-35 ft., it recovered 160 ft. of oil and 60 ft. of oil-cut mud, 300 lb. working pressure, using ¼-in. chokes. Casing was set and perforated, and the well is now being tested.

There were 26 locations reported this week, 8 being wildcats, 2 in Bee County, 2 in Brooks County, 1 each in Calhoun, Nueces, Starr and Victoria counties. Of the 20 completions 5 were dry wildcats, located one each in Atascosa, Bastrop, Jim Hogg, McMullen, and Travis counties.

SOUTHWEST TEXAS WILDCAT FAILURES

Atascosa County: Gulf 1 Emma Tartt et

al, James Wilkinson Survey, 14 miles southwest of Hobson field, dry at 6,632 ft.

Bastrop County: General Crude Oil 1 Addie M. Powell, J. M. Banks Survey, 3½ miles northwest of Bastrop, dry at 3,638 ft.

Jim Hogg County: Humble 1-D Mestina Oil & Gas Co., Jose I. Salinas Survey, 12 miles southeast of Hebbronville, dry at 10,460 ft.

McMullen County: Dee Davenport 2-A Annie Graves Dolph et al, H. Pressler Survey, Section 53, Abstract 1109, 6½ miles southwest of Ezzwell Field, dry at 1,396 ft.

Travis County: E. R. Marts 1 C. Jacobson, Harrison Survey, 650 ft. south of south corner of Elroy Townsite, dry at 1,459 ft.

TEXAS GULF COAST

New Liberty County Discovery Is Testing

HOUSTON.—Glenn H. McCarthy is running potential on 1-A A. G. Blanke, discovery well about 3 miles northeast of Hankamer in Liberty County. Test is being made in perforations around 8,497-8,500 ft., but no gage is available yet.

In the Rayford area of southern Montgomery County, about 3 miles northeast of Spring, Humble Oil & Refining Co. 1 E. L. Bender et al, Montgomery County School Land Survey 2, Abstract 351, a Wilcox wildcat, was abandoned at 10,996 ft., after failing to find commercial possibilities in either the Cockfield or Wilcox zones. A drill-stem test at 6,216-23 ft. in the Cockfield had recovered salt water.

In the Lake Creek field area, the Herton Oil Co. 1-B Williams, in A. Hodge Survey, was abandoned at 9,970 ft. This test was about 3,500 ft. southwesterly from Stanolind Oil & Gas Co. 1 Williams, recently completed gas well. The Herton test found salt water at 9,785-9,805 ft. and at 8,700-40 ft.

Amerada Petroleum Co. and Sun Oil Co. 1 Morrison, a wildcat 3 miles southeast of Blessing, in Matagorda County, which blew out last week, is reported not yet entirely under control. Mud was still being pumped in and rams were being installed at last report. Total depth is 10,273 ft.

Salt Dome Oil Corp. and Butcher-Arthur, Inc., 1 C. W. Massey, a wildcat in H. T. & B. Survey, Abstract 548, Section 22, 4½ miles north of Manvel, Brazoria County, was abandoned at 6,520 ft.

Of the 25 new locations reported this week 9 were wildcats, 3 in Jackson County, 1 each in Brazoria, Chambers, Fort Bend, Harris, Tyler and Wharton counties. Chambers County lead with 5 locations. There were 22 completions of which 10 were wildcats, 1 gas-condensate discovery in Harris County, and 9 dry holes. Livingston field lead with 3 producers completed.

UPPER GULF COAST SUCCESSFUL WILDCAT

Harris County: Gas-Condensate Discovery—Lenoir M. Josey, Inc., 1-A Lenoir M. Josey, Inc., H. & T. C. Survey, Section 17, 4 miles southeast of Cypress, 1½ miles north of Joyce Richardson field, total depth 7,572 ft., perforated, 40 holes, 6,955-65 ft., PT 31,000,000 cu. ft. gas daily open flow, 17 bbl. condensate per million, tubing pressure 2,400 lb., casing pressure 2,200 lb., on ¼-in. choke, no water.

UPPER GULF COAST WILDCAT FAILURES

Brazoria County: Salt Dome Oil Corp. & Butcher-Arthur, Inc., 1 C. W. Massey, H. T. & B. Survey, 4½ miles north of Manvel, dry at 6,520 ft.

C. H. Alexander 2 Blumer Heirs, H. T. & B. Survey, 2½ miles southeast of Pearland, dry at 7,702 ft.

Fort Bend County: Texas Co. 1 Mason Briscoe, John Foster Survey, Abstract 26, 3½ miles southeast of Fulshear, dry at 8,017 ft.

Harris County: Hatton, Trustee (Francis M. Blair, Jr.) 1 Joseph F. Meyer, Jr., et al, W.C.R.R. Survey, Abstract 934, 3 miles southwest of Humble, dry at 4,252 ft.

Jefferson County: Sun Oil 1 American National Bank, B. B. B. & C. Survey 396, Abstract 97, 17 miles southwest of Beaumont, dry at 10,081 ft.

Montgomery County: Humble 1 E. L. Bender et al, Montgomery County School Lands Survey 2, Abstract 351, 3 miles northeast of Spring, dry at 10,996 ft.

Tyler County: General Crude Oil 1 Mattie Wilson, in Mrs. Elam Cherry Survey, Abstract 798, 6 miles west of Rockland, dry at 7,504 ft.

Washington County: M. H. Marr 1 Arnold Lammert, A. Kuykendall Survey, 10 miles northwest of Brenham, dry at 6,042 ft.

Wharton County: Superior Drilling Co. 1 H. P. Stockton, I.R.R. Survey, Louise Area, dry at 5,915 ft.

SOUTH LOUISIANA

New Field Opened in St. Mary's Parish

NEW ORLEANS.—A new oil field has been opened in the Bayou Cardin area of St. Mary Parish by Humble Oil and Refining Co. 1-H Miami Corp. Drilled to a

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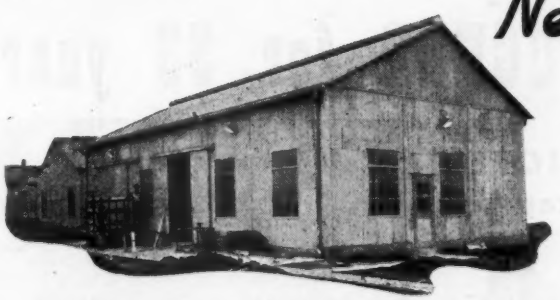

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total depth of 11,919 ft., with 7-in. casing set at 11,849 ft., pipe was perforated with 70 shots from 11,600-11 ft., 2½-in. tubing set with packer at 11,549 ft. Based on a 11½-hour gage, it flowed at the rate of 219 bbl. per day through a ½-in. choke, tubing pressure 1,400 lb., gravity 34.8°, gas-oil ratio 377 to 1.

In the Venice field of Plaquemines Parish, Tide Water Associated Oil Co. opened a new sand at the 19 Manhattan, 26-21s-30e. With perforations at 7,962-80 ft., it flowed 173 bbl. per day through a ½-in. choke, gas-oil ratio 430 to 1, tubing pressure 1,100 lb., gravity 31.9°.

In Vermilion Parish, 6 miles north of the Abbeville field, Ohio Oil Co. 1 E. Lelande, a wildcat in 8-11s-3e, in the Leroy Area, is preparing to plug and abandon after finding only salt water on tests in deep sands below 11,000 ft. Total depth is 11,968 ft., with 5½-in. casing set to 11,957 ft. Several tests were run, all of which recovered salt water.

There were 12 new locations reported this week with only 1 wildcat in Evangeline Parish. West Tepetate field led with 3 locations. Of the 17 completions 1 was a new sand in Venice field, Plaquemines Parish, 1, a dry wildcat. Acadia, St. Mary and Vermilion parishes each had 3 completions.

SOUTH LOUISIANA SUCCESSFUL WILDCATS

Plaquemines Parish: New Oil Pay Venice Pool—Tide Water Associated Oil Co. 19 Manhattan Land & Fruit Co., 26-21s-30e, TD 9,852 ft., perforations, 80 holes, 7,962-80 ft., PT 173 bbl. day through ½-in. choke, gas-oil ratio 430 to 1, tubing pressure 1,100 lb., gravity 31.9°.

SOUTH LOUISIANA WILDCAT FAILURES

Calcasieu Parish: W. T. Burton 1 W. T. Burton-Fee, 15-11s-10w, dry at 10,401 ft.

MICHIGAN

Wildcatters Have Poor Week

SAGINAW. — Completions in the past week totaled 26, resulting in 11 oil producers with a daily initial potential of 15,250 bbl., two gas producers, and 13 dry holes, including eight unsuccessful wildcat tests. Twenty-two new locations were announced. They are listed, four in Arenac County, two each in Kent, Allegan, Montcalm, Ottawa and Midland, one each in Saginaw, Osceola, Bay, Gladwin, Mecosta, Montmorency, Clinton and Isabella.

Four big producers in Allegan County's Deep River pool accounted for the bulk of new production. Featured in the wildcat failures was a deep test in Washtenaw County.

MICHIGAN WILDCAT FAILURES

Allegan County, Heath Township: Fletcher-Lemand 1 Bussies, SE NE NE 16-3n-14w, dry in Traverse Limestone, TD 1,524 ft.

Clare County, Hamilton Township: Sun Oil 1 Trust and Wilson, NE 17-19n-3w, dry, TD 1,415 ft.

Lincoln Township: A. L. Scraitchfield 1 Kyte, C NE 22-18n-5w, dry, TD 1,609 ft.

Huron County, Dwight Township: Charles W. Teater 2 Ignash, S½ NW NE 22-18n-5w, dry, TD 3,290 ft.

Montcalm County, Evergreen Township: Allegan Pipe & Supply 1 Greenhoe, NW NE SE 28-10n-6w, dry, TD 3,352 ft.

Douglass Township: L. T. Barber-Michigan Consolidated Gas 1 Gyger-Barber-State, W½ SE NW 1-11n-7w, dry, TD 1,284 ft.

Osceola County, Osceola Township: Taggert Brothers 1 Postal Estate, SE 5-18n-8w, dry, TD 1,762 ft.

Washtenaw County, Superior Township: W. H. Colvin, Jr., et al 1 Meinzinger, SE NE NW 12-2s-7e, dry, TD 5,692 ft.

PERMIAN BASIN

Another Devonian Pool Opened in Andrews County

MIDLAND. — Magnolia Petroleum Co. and Humble Oil & Refining Co. 1 Cowden, a wildcat in the southwest corner of Andrews County, will be completed in the Devonian, topped at 7,778 ft., 4,643 ft. below sea level. The test will open the third Devonian field for the county. On the last drill-stem test from 7,932-69 ft., tool open 1 hour, 630 ft. of oil-cut drilling mud was recovered. Total depth is 8,051 ft. The wildcat originally was contracted to explore the Ellenburger to 12,000 ft.

Shell Oil Co., Inc., and The Texas Co. 1 Ratliff & Bedford, a wildcat in southwestern Andrews, with total depth of 11,469 ft., is preparing to run casing. It is reported that the well will be dually completed in the Devonian and the Ellenburger. The last drill-stem test from 11,427-469 ft., tool open 90 minutes, recovered 550 ft. of drilling mud cut with oil, gas and sulfur water and 4,900 ft. of sulfur water. Humble 88-X Means, a deep test in the Means field of northeastern Andrews, ran a 1-hour drill-stem test in the Devonian from 12,102-350 ft. and recovered 1,700 ft. of sulfur water. Operator was drilling ahead at 12,386 ft. in lime and chert. DeKalb Agricultural Association 1-C Lockhart & Brown, 1¾ miles northeast of Sun Oil Co. 1 Martin, recent discovery in south central Andrews, is dry at 7,257 ft. in the lower Permian. The test had slight shows of oil and gas above 7,000 ft., but the oil was not of commercial quality.

Humble 1 W. E. Gresham, a wildcat in eastern Upton County, 1 mile northwest of 1 Parrott recently completed for 5 bbl. of oil daily, is abandoned at 9,550 ft., having been unable to recover parted pipe. Byrd-Frost 1 Griesecke, a wildcat 2 miles southwest of the Wentz pool in northeastern Pecos, is considered dry at 4,668 ft. after drill-stem test above 4,579 ft. recovered 100 ft. of drilling mud with no shows. Gulf Oil Corp. will drill 1 N. B. Hancock, 1½ miles east and ½ mile north of Stanolind Oil & Gas Co. 1 Edwards, recently completed for 386 bbl. of 32.2° gravity oil from 5,025-80 ft. in the San Andres.

Cities Service Oil Co. 1-B Thomas, between the TXL pool discovery in western Ector County and Shell Oil Co. and Cities Service 1-C TXL, dry hole, has shown for flush production. On a 1-hour drill-stem test from 8,070-8,115 ft. there was gas to the surface in 6 minutes and oil was flowing in 7 minutes. It flowed 106 bbl. of oil the last 45 minutes. Recovery was 1,100 ft. of oil, with gas volume reaching a maximum of 2,400,000 cu. ft. daily.

The Fullerton field, Andrews County, had 3 completions and the Waddell field, Crane County, had 2. The Garza field, Garza County, and the McCamey field, Upton County, had 3 locations each while the Wasson field, Yoakum County, had 2.

WEST TEXAS WILDCAT FAILURES

Crane County: Gulf 1-A-E A. H. Scott, Sec. 20, Blk. B-20, PSL Sur., 1¾ mi. NW Sand Hills pool, elev. 2,584 ft., Ellenburger 7,578 ft., dry, TD 7,758 ft.

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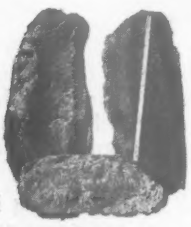

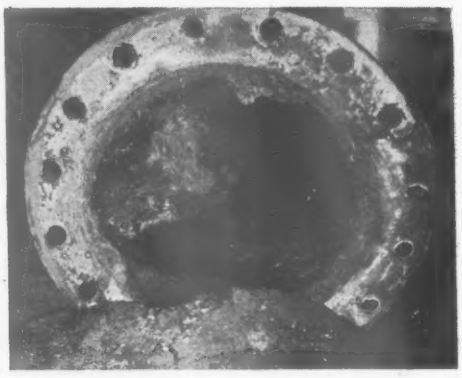

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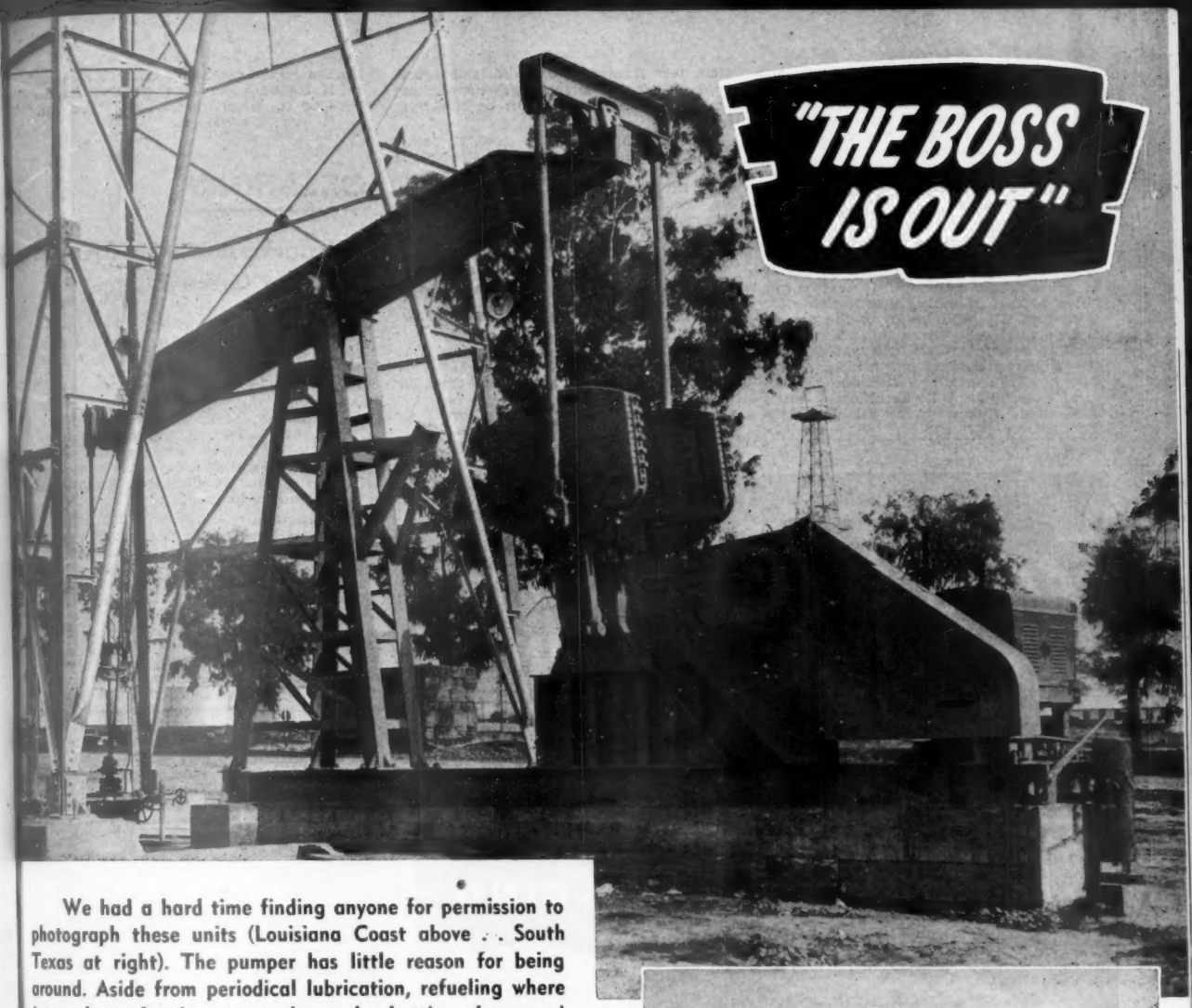

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Terry County: George P. Livermore and Honolulu Oil 1 Abilene State Bank, Sec. 16, Blk. D-14, C&M Sur., 6 mi. S and 1½ mi. W of NW corner of county, elev. 3,565 ft., San Andres 4,480 ft., dry, TD 5,253 ft.

SOUTHEASTERN NEW MEXICO

HOBBS.—The Texas Co. 2 Lockhart, 1¼ miles southeast of the Holt discovery in the Drinkard area of southeastern Lea County, ran a 90-minute drill-stem test from 5,125-5,230 ft. and recovered 240 ft. of oil and gas-cut mud. It was coring below 5,250 ft. Humble Oil & Refining Co. 1 Penrose, 1¼ miles south of the discovery, perforated 5½-in. casing with 4 shots per foot from 5,250-5,321 ft. It was swabbed for 12 hours, swabbing dry with no shows. Operator will acidize. DeKalb Agricultural Association 1 L. E. Elliott, 2 miles south of the discovery, ran a 2-hour drill-stem test from 5,584-5,635 ft. and recovered 180 ft. of slightly gas-cut drilling mud. A drill-stem test will be run from 5,600 ft.

Stanolind Oil & Gas Co. 1 W. H. Jones, a wildcat 7 miles southeast of Hobbs, has shut off water at plugged-back depth of 7,938 ft. Total depth is 10,580 ft. in granite. Permeability test was being run to determine zone for acid treatment.

Caprock field, Lea County, had 2 completions this week, while the Drinkard-Yeso field, Lea County, had 4 new locations.

SOUTHEASTERN NEW MEXICO WILDCAT FAILURES

Eddy County: R. L. Harrison et al 1 Crockett-Spencer, 19-18s-26e, 3 mi. W Dayton pool, elev. 3,421 ft., dry, TD 1,606 ft.

Lea County: George P. Livermore 1 I. C. Breckon, 7-18s-39e, 3 mi. E and 4 mi. N Hobbs, elev. 3,654 ft., San Andres 4,890 ft., Glorietta 6,250 ft., Tubb 7,440 ft., dry, TD 7,745 ft.

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OKLAHOMA

Anadarko Basin Prospects Creating Great Interest

INTEREST in the Anadarko basin prospects leaped to a new high this past week, as the result of opening a new pool of probable substantial size in McLain County; either a large extension, or another Bois d'Arc pool, south of West Edmond; indications that Superior Oil Co. had found promising indications in its Major County wildcat; and possibilities in Pure Oil Co.'s tests of the Keyes structure in Cimarron County in the Oklahoma Panhandle.

McLain County.—Flowing 1,282 bbl. of 44.7° gravity oil in 24 hours through a ½-in. choke, from 47 ft. of pay in the Simpson, through 192 perforations at 10,943-90 ft., Oklahoma's hottest wildcat, Cities Service-Mid-Continent Petroleum-Phillips Petroleum 1 Lawson, SW NW 22-5n-4w, north of Lindsay in southwestern McClain County, lived up to all but the most optimistic expectations this week. Official information released for the first time, indicated an additional 50 ft. of saturated pay sand, higher in the hole, remains to be tested. Official data was that the Bromide was topped at 10,803 ft., and saturated intervals were found from there to the bottom at 10,997 ft. Confirmation was also given to reports of an oil flow from the Hunton while drilling.

Oklahoma County.—Possibilities of an eight-section southward extension to the West Edmond field loomed as Phillips Petroleum 1 Airport, NE NE 8-12n-4w, flowed 340 bbl. in 8 hours through chokes varying from 11/32 to 31/64 in. after a 500-gal. acid mud wash of the Bois d'Arc pay. Setting 7-in. casing at 7,249 ft., and perforating with 60 shots at 7,220-33 ft., official reports stated that 58 ft. of saturated Bois d'Arc had been encountered.

The nearest regular West Edmond wells are about 1½ miles north in the S½ of 33-13n-4w. To the southeast, in 22-12n-4w, are the two condensate wells found in the Bois d'Arc, which has been labeled Bethany pool, but which some geologists now believe will connect up through the new well to the West Edmond field. The two condensate wells are in NE NE and NW SE Section 22. Complicating the picture, a third test in SW SW Section 22 is now testing and making both oil and salt water.

Major County.—Despite vigorous protests and legal petitions by royalty owners, Superior Oil Co. 1 Manning, NE NW NW 27-22n-10w, near Ringwood, Major County, is still a "tight" hole. Unofficial reports are that after flowing by heads at 3 to 4 bbl. per hour from a Pennsylvanian sand (possibly Prue), it was shot and swabbed. A 500-bbl. water tank has been cleaned out, two new 500-bbl. oil tanks erected, and a high-pressure separator is reported being installed, apparently in preparation for further testing.

Cimarron County.—Pure Oil Co. 1 Oklahoma State, SE SE NW 7-5n-8ecm, closely watched wildcat in the Oklahoma Panhandle, is reported repairing motors on cable tool unit at plugged back total depth of 4,063 ft. Upon completion of repairs, the well will be cleaned out and reshot to test sand in the basal Pennsylvanian, from which 7½ bbl. of oil was swabbed in 10 hours.

Cleveland County.—J. E. Crosby, Inc., and Warren Petroleum Co. 1-A Stotts,

NE NW SE 30-10n-3w, extended the West Moore pool a location west with a second Wilcox sand well that flowed 70 bbl. per hour through a ¼-in. choke.

OKLAHOMA SUCCESSFUL WILDCATS

Creek County: New Oil Pool—Mid-Continent 1 Hittie, SW NE SE 8-17n-8e, pumped 25 bbl. from Dutcher at 3,230-40 ft., TD 3,331 ft., Bartlesville 2,823 ft., Dutcher 3,223 ft.

Okfuskee County: New Oil Pool—C. W. Titus 1 Miracle, NW SW NW 31-11n-9e, flowed 12 bbl. oil and 1,000,000 cu. ft. of gas from Hunton at 3,869-87 ft., TD 3,889 ft.

New Gas Pool—J. T. Hall 1 Ahrens, NW SE 32-10n-12e, 750,000 cu. ft. gas from sand at 2,095-2,120 ft., TD 2,124 ft.

Pittsburg County: New Gas Pool—Public

(Continued on page 153)

OHIO, KENTUCKY

Clayton Field Gets Small West Extension

COLUMBUS.—Preston Oil 4 Earl Baker, Section 34, Hopewell Township, Perry County, flowed 50 bbl. and swabbed 25 bbl. to extend the Clayton Field Clinton sand outlyer a location west. The company has made an offset location to the west.

The Hemlock Grove Berea sand pool had another encouraging completion along the east side. Preston Oil 1 O. D. Hess, Section 3, Bedford Township, Meigs County, flowed 70 bbl. in 24 hours. Twelve new locations have been staked in the pool.

The Huntington Township gas pool in Lorain County was extended both east and west by two completions. Ohio Fuel 1 F. A. Murray, Lot 2, gaged 5,120,000 cu. ft. in the Clinton at 2,413-2,425 ft. Ohio Fuel 1 H. C. Kelsey, Tr. 12, gaged 2,940,000 cu. ft. at 2,493-2,504 ft.

Ashland-Lorain and Cambridge fields led in both completions and new locations this week.

OHIO WILDCAT FAILURES

Muskingum County, Springfield Township: Atha Realty 1 B. C. Blaney, Section 16, Clinton 3,357-3,401 ft., dry, TD 3,499 ft.

Washington County, Grandview Township: Reno Oil and Gas 1 Whitten Stewart, Section 11, Warren, no sand, TD 3,400 ft.

Grover Hendershot 1 Lucinda Grimes, Section 11, Warren, no sand, TD 3,600 ft.

WESTERN KENTUCKY

OWENSBORO.—The Dixie pool, in Henderson County, has been extended to the west by Sun Oil Co. 1 Fannie Pritchett, NW SE SW 21-0-22, about 1 mile south of the village of Dixie. This well is good for 100 to 200 bbl. natural from the Cypress sand at 2,309 ft. The Joe Reznik et al 1 Woodall, 7-K-20, in Crittenden County, 11 miles northeast of Marion, which had a good drill-stem test, is waiting on 3½-in. casing to set.

There were 9 completions this week, 4 oil wells with total initial production of 286 bbl. and 5 dry holes, 3 of the latter being wildcats. New operations reported totaled 15, Union County leading with 9, followed by Henderson with 4, Daviess, and Webster 1 each. The only new wildcat start reported was Wm. E. Styles 1 Morganfield Coal, at the north edge of Morganfield, in Union County.

WESTERN KENTUCKY WILDCAT FAILURES

Henderson County: Cherry & Kidd 1 R. M. Sigler, 13-0-22, 2½ mi. south of Corydon, dry, TD 2,701 ft., elev. 381 ft., Lower Glen Dean 1,960 ft., St. Gene-

(Continued on page 162)

LA.-ARK.

Union County Wildcat Tests 1 Bbl. Per Day

MAGNOLIA.—The only wildcat in Arkansas in the testing stage is the H. E. Wassom A-1 Union Sawmill, SW SE SE 8-18s-12w, in Union County. Seven-inch pipe was cemented at 2,320 ft., operators drilled out to 2,357 ft., and tested an estimated 1 bbl. of oil per day. Drilling is continuing below 2,364 ft. with cable tools.

The Village field in Columbia County has added a condensate well in the Durbin Bond, trustee 1 Townsite, 100 ft. south of center of S½ S½ SE 10-17s-19w. Producing from an open hole at 7,406-10 ft., the well tested 105 bbl. per day of colored condensate through ⅛-in. tubing choke. Gravity of the condensate is 55.5°.

North Louisiana had only two completions this week, one a small oiler in the Bellevue field, and the other a dry wildcat in LaSalle Parish. In Arkansas, one Union County dry wildcat was completed and two field wells. Stephens field had a dry hole, and Hillsboro field completed a 22-bbl. oil well.

ARKANSAS WILDCAT FAILURE

Union County: Lion Oil 1 Dumas, 100 ft. west of center of NE SW SW 9-17s-16w, dry, TD 6,730 ft.

NORTH LOUISIANA WILDCAT FAILURE

LaSalle Parish: H. L. Hunt F-128 Nebo Oil, 3,300 ft. west and 660 ft. north of SE corner of 36-8n-3e, dry, TD 9,350 ft.

MISSISSIPPI

New Pool Opened In Choctaw Co., Alabama

JACKSON.—Alabama seems assured of a new pool in the Carter Oil Co. 1 Alman, 300 ft. north and 396 ft. east of SW cor. NE SW 5-10n-3w, in Choctaw County. Oil shows were cored in the Eutaw, cut at 3,337 ft., and a drill-stem test at 3,416-46 ft. recovered 210 ft. oil and mud and 180 ft. of 17.4-gravity oil. Casing has been set at 3,460 ft., and production tests will follow.

The Sohio Petroleum Co. 1 Brumfield, new pay discovery in the Tinsley field, is running bottom pressure tests on the new Brumfield sand. After being shut in 48 hours, bottom-hole pressure was 2,526 lb. The well was opened on ¼-in. tubing choke, and while flowing at the rate of 23 bbl. per hour, bottom-hole pressure was 2,448 ft. Corrected gravity of the oil is 46.6°.

Completions in Mississippi this week totaled eight tries, with four oilers. Two wildcats completed were dry. Eucutta pool headed the list with three oil completions. Alabama and Florida had one dry wildcat each. Mississippi has reported 10 new locations, including a wildcat start each for Jasper and Yazoo counties.

ALABAMA WILDCAT FAILURE

Clarke County: California 1 Scotch Lumber Co., 660 ft. south and 3,336 ft. west of NE corner of S/2 25-10n-1w, dry, TD 5,154 ft., Massive sand 4,810 ft.

MISSISSIPPI WILDCAT FAILURES

Scott County: Pan-American Production 1 U.S.A., 1,520 ft. south and 1,980 ft. east of NW corner 26-5n-6e, dry, TD 7,252 ft., Massive sand 7,238 ft.

Warren County: Union Producing 1 Harlen, SW SE SE 1-14n-3e, dry, TD 11,719 ft.

FLORIDA WILDCAT FAILURE

Calhoun County: Pure 1 St. Andrews Bay Properties Co., 785 ft. north and 660 ft. west of SE corner of 2-1s-11w, dry, TD 3,580 ft.

KANSAS

Ness County Wildcat Is Probable Discovery

THE Chalmette Petroleum Co. 1 Bowman, NW NW NE 31-19-25w, a wildcat test about 6 miles south of the Aldrich pool, may be opening a new pool in the Mississippi lime. Topeka was cut at 3,415 ft., Lansing at 3,933 ft., and Mississippi lime at 4,551 ft. A drill-stem test taken at 4,553-83 ft. yielded 800 ft. of oil and 690 ft. of oil-cut mud. Five-inch pipe has been set at 4,563 ft., and operators are waiting on cement.

Decatur County.—Continental Oil Co. 1 Brown, NE NE NE 33-3-27w, 14 miles north of Adell pool of Sheridan County, logged good oil shows in the Lansing lime. Pipe was set at 3,767 ft., and total depth is 3,982 ft.

Ellis County.—El Dorado Refining Co. and B. & R. Drilling Co. 1 Kingsley, SE NE SE 34-13-20w, just north of the Pleasant pool, is pumping 25 bbl. of oil per hour. Pipe was set at the top of the Arbuckle, cut at 3,828 ft., and total depth is 3,844 ft. The well had a 2,300-ft. fillup, and then acidized.

Kansas completions for the week totaled 38, including 11 oilers. Field completions were well scattered, with Lost Springs pool taking first place with two oil wells completed. Wildcats included a gas discovery in Barber County, and 10 dry holes. Thirty-four new locations have been announced, four of these being wildcats. Stafford County has two new wildcat starts scheduled, with one each for Decatur and Ellis counties.

KANSAS SUCCESSFUL WILDCAT

Barber County: New Gas Pool—Drillers Gas Co. 1 Skinner, W/2 NW NE 16-31-14w, est. 20,000,000 cu. ft. gas from Maquoketa at 4,340-44 ft., TD 4,344 ft., Kansas City 3,765 ft., Maquoketa 4,337 ft.

KANSAS WILDCAT FAILURES

Barton County: W. L. Hartman 1 Harris, NE SE NW 31-19-12w, dry, TD 3,430 ft., Aruckle 3,396 ft.

Butler County: Western Petroleum Exploration 1 Craft, SE SE SE 14-29-7e, dry, TD 3,267 ft., Arbuckle 3,254 ft.

Cowley County: Ace Gutowsky 1 Trimper, SE SE NW 11-35-3e, dry, TD 3,900 ft., Arbuckle 3,848 ft.

Edwards County: Superior 1 Garey, NW NW NW 27-25-18w, dry, TD 5,091 ft., Arbuckle 5,027 ft.

Graham County: W. L. Hartman 1 Towns, SE SE SE 5-10-21w, dry, TD 3,928 ft., Arbuckle 3,878 ft.

Greenwood County: Zappas & McGinnis 1 Lungwitz, SE SE NE 3-27-10e, dry, TD 2,261 ft., Mississippi lime 2,145 ft.

E. S. Adkins 1 Dater, SE NW 14-24-8e, dry, TD 3,118 ft., Arbuckle 3,069 ft.

Sedgwick County: Eldorado Refining 1 Fuller, SW SW SE 36-29-2e, dry, TD 3,472 ft., Mississippi lime 3,095 ft.

Helmerich & Payne 1 Rausch, SE SE NW 14-27-3w, dry, TD 4,274 ft., Arbuckle 4,262 ft.

Sumner County: Carter 1 Webber, 200 ft. southwest of center of NW SE 26-31-4w, dry, TD 4,617 ft., Arbuckle 4,557 ft.

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Among the Drilling Contractors

Keys Drilling Co. will drill a wildcat test in Graham County, Kansas, deal for which Sam K. Pack has made with W. L. Hartman. The operation is the 1 Stady, in SE SE SW 32-8-22w, 6 miles west of production in the Morel pool.

Petroleum Engineering Co. has been organized in Los Angeles by Russell D. Gardner as general manager and will engage in the drilling-contract business in Los Angeles and San Joaquin Valley districts.

Snyder & Head, Calgary, Alta., have practically completed rigging at Pekisko Hills 1, LSD 6, 6-17-2w5 on the Pekisko structure south of Turner Valley. They have contract to deepen from 4,400 ft. to test the Devonian limestone.

Royer-Farris are drilling contractors on the El Dorado Refining Co. 1 Urban, a wildcat in NW NE NW 21-16-17w, Rush County, Kansas. Test is 15 miles northwest of production in the Otis pool.

Gene Reid Drilling Co., Los Angeles, has been awarded drilling contract for 2 Dresser to be drilled for Norris Stamping & Manufacturing Co. in the Paso Robles district of San Luis Obispo County, California. Location has been made for the well and early drilling is contemplated.

Structure Drilling Corp., Montreal, Que., has a contract with New York interests for a well to be drilled on the Gaspe Peninsula, Quebec, on acreage reported on by Dr. J. O. G. Sanderson, consulting geologist, of Calgary.

Herndon Drilling Co. has been awarded drilling contract on the British-American Oil Co. 2 Petrie, in NW SW SW 36-26-1w, Sedgwick County, Kansas. Test is 4 miles southwest of production in the Valley Center pool.

Northern Development Co., of Edmonton, Alta., is nearing completion of S.A.C. (Alberta) Oils 2, LSD 1, 12-49-1w4 in the Alberta section of the Lloydminster field.

Joaquin Drilling Co., Los Angeles, has been awarded contract to drill an 8,000-ft. test in Weld County, Colorado, a joint venture by The Ohio Oil Co. and Tide Water Associated Oil Co.

Helmerich & Payne, Inc. are drilling contractors on the Stanolind Oil & Gas Co. 1 Wiltrout, in SW SW SW 35-4-20w, Phillips County, Kansas, 2½ miles north of production in the Hansen pool.

R. L. Kellogg, California drilling contractor, drilling Tide Water Associated Oil Co.'s deep test in the Ventura Avenue field, had reached 11,681 ft. in 21 McGonigle and landed 6⅝-in. casing at 11,018 ft.

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Regent Drilling Co., Calgary, Alta., has a contract with United States interests represented by Erwin Millner for Martin 1 well to be drilled in LSD 2, 17-42-6w4, on the Vale Dome in Wainwright Buffalo Park, Central Alberta.

Drilling Contractors Protest Rig-Evaluation Rates

JACKSON, Miss. — A schedule of rates for assessing drilling rigs has been set by the state tax commission and assessors of oil-producing counties as follows:

Diesel and diesel-electric rigs capable of drilling over 7,500 ft., $45,000; steam rigs drilling more than 7,500 ft., $40,000; diesel and diesel-electric, 5,000 to 7,500 ft., $30,000; steam rigs, 5,000 to 7,500 ft., $25,000.

These rates have been protested by Bernard L. Tighe, Jr., attorney for drilling contractors, on the basis that they are higher than assessments which have been in force, and that the minimum rates are higher than the maximum rates of any other oil state.

Assessors explained that under the law they have no choice but to evaluate all property equally but that other states have legislation which is designed to take care of oil drillers.

Tighe cited figures obtained from tax commissions of other oil states showing that in none of them are the heaviest type rigs assessed for as much as $20,000. Among the maximum assessments per rig cited were: Arkansas, $10,000; Colorado, $13,500; Illinois, $7,500; Louisiana, $15,000; Kansas, $18,000; Wyoming, not over $20,000 on new rigs; Oklahoma, $16,000, and Texas, $15,000.

Oklahoma Fields

(Continued from page 151)

Service 1 Hartgrove, NW SW 32-8n-14e, 1,500,000 cu. ft. gas from Booch lime at 1,984-2,040 ft., TD 2,040 ft.

OKLAHOMA WILDCAT FAILURES

Cleveland County: Smith Brothers 1 Mack, SW NE SE 24-9n-1e, dry, TD 6,222 ft., second Wilcox 6,134 ft.

Creek County: Producers Pipe & Supply 1 Moore, NE SE NW 17-15n-9e, dry, TD 3,676 ft., second Wilcox 3,650 ft.

Mid-West Producing 1 McFarland, SW SW NE 26-15n-9e, dry, TD 3,705 ft., second Wilcox 3,690 ft.

Garfield County: Gutowsky 1 Zaloudek, NW SW 21-24n-6w, dry, TD 6,735 ft., second Wilcox 6,657 ft.

McIntosh County: Continental & Kay Co. Gas 1 Follansbee, SE SE SW 13-9n-13e, dry, TD 3,654 ft., Cromwell 3,583 ft.

Noble County: Midco 1 Moltby, NW NE NE 25-24n-2w, dry, TD 4,527 ft., Wilcox 4,520 ft.

Okfuskee County: C. W. Titus 1 Welty, SE SE NW 32-12n-8e, dry, TD 3,757 ft., Cromwell 3,746 ft.

Seminole County: Wenona 1 Bruner, NW SW SW 24-10n-7e, dry, TD 3,661 ft., Cromwell 3,612 ft.

Ashland 1 Yarbrough, NE NE SE 1-9n-6e, dry, TD 3,679 ft., Booch 3,653 ft.

PENBERTHY
"REFLEX"
WATER GAGE SET

For oil field, locomotive type and marine boilers. Water shows black — steam shows white; the water level is unmistakable. U-Bolt construction is strongest and simplest to service. Glass replaced by simply removing nuts on face of gage . . . unnecessary to work between gage and boiler. Conforms with A.S.M.E., Federal and State requirements when used for pressures specified by their respective codes.

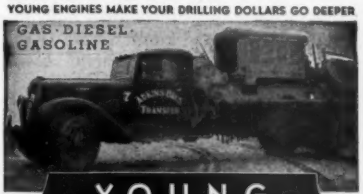
This is one of the complete line of Penberthy gages that meet every liquid level gage requirement.

PENBERTHY INJECTOR CO.
DETROIT, MICH. Canadian Plant WINDSOR, ONTARIO

YOU SAVE TIME ALL THE TIME WITH Young DRILLING ENGINES

Because of their unit construction and skid base mounting, you can move a YOUNG Drilling Engine with minimum trouble and do it quickly. When you get it on location, those same advantages help speed your set-up. No elaborate foundation is required. From then on your savings in time begin to pile up. No gears to shift—instant reverse with a single movement of the control lever. Brake sets automatically when clutch is disengaged. Ample power for fast pulling-out. On jobs where time is money, the time you save every day with a YOUNG Drilling Engine really counts.

YOUNG ENGINES MAKE YOUR DRILLING DOLLARS GO DEEPER



YOUNG ENGINE CORP.
CANTON, OHIO

A. E. Avers, P. O. Box 606, Tulsa, Oklahoma
Iverson Tool Co., Texas, Artesia, New Mexico
Branchland Pipe & Supply Co., Huntington, W. Va.
Connelly Machy. Co., Billings & Great Falls, Mont.

OTHER YOUNG PRODUCTS
Natural Gas Carburetors • Orifice Gas Well Testers
Under-Road Boring Machines • Electric Light Plants

XUM

PERSONALS

Head of C. N. G. A. One of Original Members

M L. ARNOLD, new president of California Natural Gasoline Association, was one of the original members of the organization, joining it in July 1926. He has seen the group of gasoline men grow from a handful of individuals pioneering in a new industry to an influential body whose members contribute generously of their time and talents.

Born in Missouri, Arnold moved at an early age to Oklahoma, where he graduated at University of Oklahoma in 1923 with a B. A. in chemistry. Although he spent most of his early life in so famous an oil-producing state, he had to move to California to see his first oil well.

Soon after his arrival, he got a job with Signal Hill Gasoline Co. as a chemist.

In 1927 this company merged with Richfield Oil Corp. Arnold continued with Richfield, advancing through plant operator, plant foreman, gas tester, and chief chemist to his present position of chief engineer of the gas department. Arnold has been a director of C.N.G.A. since 1940, and was vice president in 1944. He has served also on the technical and charcoal test committees.

E. J. Handley has resigned as geophysicist for British American Oil Producing Co. in Tulsa to become geophysical supervisor for Shell Oil Co., Inc., in the same city.

A. F. Blankenship, formerly drilling superintendent for Magnolia Petroleum Co. in the West Texas area, has been transferred to Oklahoma City as drilling superintendent and assistant to **A. P. Proctor,** division production superintendent for Oklahoma and part of North Texas.

Dr. A. P. Patrick, formerly vice president of McDougall-Segur Exploration Co., Calgary, has been made president, succeeding the late T. M. Carlyle. **F. M. Graham** has taken Patrick's place as vice president.

James H. Eckert, formerly agent at Dubois and Brookville, Pa., for United Natural Gas Co., has been promoted to district commercial manager for the eastern district, with headquarters in Ridgway, Pa. Eckert has been with the United Natural group 30 years.

C. R. Gallagher, Lubbock, Tex., formerly president of Permian Oil Corp., which sold its holdings in West Texas to Stanolind Oil & Gas Co., has been named Texas manager for Redfern Oil Co., recently organized to operate in the Permian basin, with offices in Lubbock.

B. E. Thompson, for 26 years on the geological staff of Gulf Oil Corp., has been appointed division superintendent in the production department of the company's Fort Worth district. He is a Rensselaer Polytechnic Institute graduate. **Gordon H. Fisher,** engineer and geologist, was named chief production engineer and transferred to the production department. **T. W. Rhoads,** assistant superintendent of production, will have supervision of all natural-gasoline and gas operations.

Frank Bascom, formerly superintendent for The Ohio Oil Co. at Hobbs, N. M., has been made superintendent in the Yates district of West Texas, succeeding **C. Frank Redick,** who retired after 32 years with the company.

Colbert H. Marshall, vice president, has been appointed general manager of Central Pipe Line Co.'s Illinois division. **Leslie Paris** will succeed him as manager of its Texas division. The Illinois division, with offices in Salem, handles operations in the Tri-State area. The Texas division, with offices at Longview, handles those in the East Texas area. Central's parent company, Allied Oil Co., Inc., Cleveland, Ohio, has discontinued its production office in Longview, and is now handling all production business through its offices in Oklahoma City and Dallas.

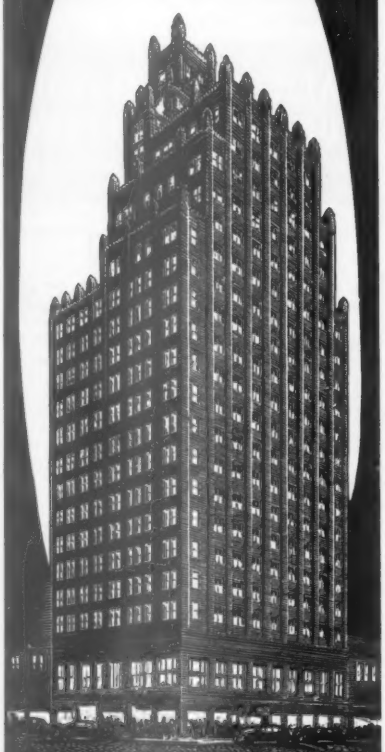
Dr. J. T. Rettaliata, manager of research and gas-turbine development for Allis-Chalmers Manufacturing Co., has been named chairman of the mechanical engineering department at Illinois Institute of Technology. Doctor Rettaliata received his B. E. from Johns Hopkins University in 1932 and his doctor of engineering degree from the same school in 1936.

Wallace E. Pratt, director and member of the executive committee of Standard Oil Co. (New Jersey) and internationally known geologist, has retired to enjoy life on his ranch near Frijole, Tex. **Ralph W. Gallagher,** chairman of the board, said Pratt's contributions to geological science have been a major factor in placing petroleum exploration on a scientific basis. Pratt, born in Phillipsburg, Kans., in 1885, graduated from University of Kansas. He started with Humble Oil & Refining Co. as chief geologist after doing geological work for the Philippine Government. He was named a director in 1923, a vice president 10 years later, and in 1937 resigned to become director and member of the executive committee of the parent company. His book "Oil in the Earth" is an authoritative volume.

Frank S. West has resigned as chief engineer in charge of gasoline and cycling-plant design and construction for The Texas Co., to become affiliated with **H. S. Cole, Jr.,** who formerly was assistant to the manager of the producing department for Texas. The two have formed a partnership, West & Cole, to engage in gasoline and cycling-plant design and consulting engineering in the field of gas, natural gasoline, and condensate recovery, with offices in Houston. West, a University of California graduate, was an engineer for General Petroleum Corp. and Union Oil Co. of California before joining Texas. Cole is vice president of Thompson-Carr, Inc., drilling contractors.

David J. Guy, formerly assistant manager of the natural resources department of Chamber of Commerce of the United States, has been appointed manager. He succeeds **Wal-**

Host to the Southwest



Owned and Managed by Texans

The BLACKSTONE

FORT WORTH'S HOTEL OF DISTINCTION

JOE T. O'KEEFE, President

E. B. HANNA, Manager

ter DuB Brookings, who, retiring after 25 years' service, will continue to serve the department in an advisory capacity.

Harry C. Weiss, president of Humble Oil & Refining Co., has been elected to special-term membership on the corporation of Massachusetts Institute of Technology. He succeeds **Edward R. Stettinius,** former secretary of state, whose term expires this year. Weiss is a trustee of Rice Institute and of Kinkaid School, in Houston. He is a member of Petroleum Industry War Council and is a Princeton graduate.

T. E. Ward, president of Oilfield Equipment Co., Inc., New York, and representative of Colombian Steel Tank Co., is on a business trip to London, England, primarily for the purpose of investigating postwar sales possibilities.

S. M. Burnap, of Direct Service Oil Co., Minneapolis, and **S. C. Bartlett,** from the Chicago office of The Texas Co., have been named members of the petroleum industry distribution and marketing committee for District 2, Petroleum Administration for War, with headquarters in Chicago. Burnap succeeds the late Phil T. Williams. Bartlett takes the place of **R. R. Kibbe,** formerly of the Chicago office and recently transferred to Boston.

Thomas W. Palmer, Standard Oil Co. (New Jersey) attorney, has been honored with the highest decoration of the Venezuelan Government for his contributions to better relations between the country and the United States. He was awarded the Order of the Liberator with the rank of commander, highest grade granted a nonofficial civilian, by President Isaias Medina. Presentation will be made through the Venezuelan Embassy in Washington. In 1936 Palmer was decorated by the Brazilian Government with the Order of the Southern Cross for similar activities. President for 3 years of the Venezuelan Chamber of Commerce of the United States, Palmer is former vice president of the Pan-American Society and a founder member of the New York chapter, Bolivarian Society.

CALENDAR

October

American Association of Oil Well Drilling Contractors, Oklahoma City, October 1-2.

Texas Mid-Continent Oil and Gas Association, Rice Hotel, Houston, October 4-6

I.P.A.A., annual membership meeting Tulsa, October 15. 16 and 17.

American Gas Association, annual meeting, Engineering Societies Building, New York, October 24.

ALTEN
Essex Pattern
IRON
LOCK COCKS

ONE OF OVER 300 ALTEN OIL FIELD PRODUCTS

See Composite Catalog for complete list or write us for catalog.

Fig. G-700

ALTEN'S
FOUNDRY and MACHINE WORKS
Established 1889 . . . . . Lancaster, Ohio
EXPORT OFFICE: 342 Madison Ave., New York 17, New York
TEXAS OFFICE: 46 San Jacinto St., Houston 1, Texas
Leading Supply Stores Carry All Alten Oil Field Equipment

SURVEYS
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GRAVITY METERS
MANUFACTURED
FOR LEASE

North American's broad services, backed by extensive experience and substantiated by most modern techniques and equipment (much of which is our own design and development) is of inestimable value in obtaining authentic subsurface data for planning future drilling operations.

NORTH AMERICAN
Geophysical Company
636 Bankers Mortgage Building
Phone Charter 4-3523
HOUSTON 2, TEXAS

XUM

Famous Facts

In pioneer days, petroleum transportation was a nightmare. Primitive trails became bottomless seas of mud through which 16 and 18-horse hitches pulled wagons from the wells to Oil Creek in Pennsylvania. Here oil was emptied into barges or rough rafts, in fact almost anything that would hold oil in barrels or bulk. Handling these unwieldy craft in the rush of water resulted in the loss of many lives and at least a million barrels of oil. The high cost of shipping by water brought forth in 1860 the first plan for transporting oil by pipe line.

Even before the days of the first pipe lines, Bitumastic Enamel—the first product of its kind—won acclaim as a protective coating for underground and under water metal surfaces.

Long a leader as a pipe line coating, Bitumastic Enamel gives maximum, long-lasting protection against corrosion. Its unexcelled qualities of good adhesion, high viscosity, resistance to soil stress, and minimum cracking tendency assure top performance under all conditions of soil and climate.

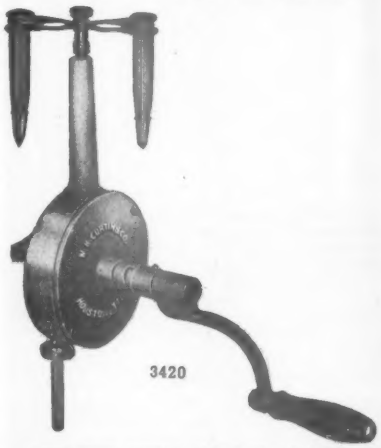
WAILES DOVE-HERMISTON
CORPORATION
WESTFIELD, NEW JERSEY
New York • Philadelphia • Cleveland • Chicago • Houston • Tulsa • Miami
San Francisco • Los Angeles

"Best Bet Yet"

NOW BACK IN FULL PRODUCTION after two years' "layoff" because of war work, these oil-proof, wear-resistant, plastic rings hydraulically pressed on all sizes of tubing collars prevent the collar-to-tubing contact that causes many expensive "wet jobs" in pumping wells.

PATTERSON-BALLAGH TUBING PROTECTORS
LOS ANGELES 1 • HOUSTON 10 • NEW YORK 6

CURTIN CENTRIFUGES



GIVE YOU QUICK, ACCURATE RESULTS WITH LESS EFFORT . . . AT LESS COST

Simple in design, ruggedly built for heavy duty service. Gear ratio and throw of crank produce required speed with no strain. Heads and cranks of 100 CC and 15 CC machines are interchangeable. Meets *A.S.T.M. Standard Method D-98* and *A.P.I. Code No. 25* requirements. Ask for full details.

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HOUSTON U.S.A. TEXAS

A. J. ARMSTRONG

O. F. JOLLY

ROBINSON ORD

A. P. KROEGER

E. L. OLIVER

D. E. NOBLE

Equipment Men in News

Five months before Pearl Harbor, Texasteel Manufacturing Co., makers of sucker rods and other items of surface pumping equipment, produced the first car load of mortar shells on the first Army ordnance contract let in Texas. Ninety-five per cent of shop facilities are still devoted to the production of shells but postwar plans, envisioning improved designs in oilfield equipment items are being blueprinted, according to **A. J. Armstrong**, president.

O. F. Jolly, who recently returned from the Bahrein Islands, where he has been engaged in construction work for the Bahrein Petroleum Co., is now employed as a sales representative for Oil Center Tool Co. with headquarters at Houston, Tex.

Robinson Ord has been appointed general manager of sales of the Organic Division of Monsanto Chemical Co., as assistant general manager of sales, succeeding Fred C. Renner who died June 26. Other promotions announced at the same time include **Arthur P. Kroeger**, who has been appointed an assistant general manager of Organic Division sales and **Charles H. Sommer, Jr.**, who will assume responsibility for sales of intermediates as well as plasticizers and resins.

On June 23 at the commencement exercises, University of California bestowed the degree of doctor of laws on **Edwin Letts Oliver**, president of Oliver United Filters, Inc.

Motorola Radio announces the promotion of **Daniel E. Noble** to the position of general manager of the Communications and Electronics Division. In his new position he will have direct authority over the engineering sales and engineering production departments of the division. He will retain his present responsibilities as director of research.

Harry A. Feldbush, formerly works manager of the Holyoke, Mass., plant of Worthington Pump & Machinery Corp., has been named vice president in charge of engineering for the entire corporation. His headquarters will be at the general offices in Harrison, N. J. **Ralph M. Watson**, formerly chief engineer of the Centrifugal Engineering Division, has been appointed assistant to Feldbush.

Mendel A. Keith, general traffic manager, International Derrick & Equipment Co., Columbus, Ohio, has been elected president of the Oil and Gas Well Supply Traffic Association. The association is a national organization of the manufacturers of oil well supplies and kindred articles. Other officers elected for the coming year are: First vice president, **L. J. Prior**, traffic manager, National Supply Co., Toledo; second vice president, **F. R. Jones**, traffic manager, Walworth Co., Kewanee, Ill.; treasurer, **H. C. Witt**, traffic manager, Jones & Laughlin Supply Co., Tulsa; secretary, **C. R. Gartrell**, traffic manager, Continental Supply Co., Dallas.

T. D. Slingman has been made manager of industrial sales of Baldwin-Hill Co., Trenton, N. J., manufacturers of thermal insulation products. Slingman was formerly vice president of mechanical sales of The Dayton Rubber Manufacturing Co.

Uhrich Supply Co., North Kansas City, Mo., has been appointed distributor of Peerless vertical and horizontal pumps in the Kansas-Missouri area by Peerless Pump Division of Food Machinery Corp. **C. H. Pratt** is manager of the Uhrich organization. Uhrich succeeds Butters Equipment & Supply Co. which is retiring from business.

W. R. McLaughlin has been appointed sales manager for the Gas Products Division of Pittsburgh Equitable Meter Co. Pittsburgh Equitable Meter Co.-Merco Nordstrom Valve Co. announces appointment of **A. G. Kirker** to the position of service engineer in the Boston district office to operate under the jurisdiction of **F. C. Arens**, district manager.

H. A. FELDBUSH

M. A. KEITH

T. D. SLINGMAN

J. E. Gesner recently rejoined Reliance Regulator Corp., division of American Meter Co., as engineer.

Walter F. Munford has been named assistant vice president of American Steel & Wire Co., subsidiary of U. S. Steel Corp.

Homestead Valve Manufacturing Co., Coraopolis, Pa., has appointed **Don H. Krey** as sales manager, and **Elliott G. Johnson** as assistant sales manager. Johnson will retain his duties as director of advertising and public relations.

Henry A. Mullen, formerly welding supervisor at the Willow Run plant of Ford Motor Co., has joined the sales department of Ampco Metal, Inc., Milwaukee, Wis. He will be attached to the Detroit field engineering office as resistance welding consultant.

Charles A. Butcher, formerly manager of the Pacific Coast manufacturing and repair department of Westinghouse Electric & Manufacturing Co., Oakland, Calif., has been appointed assistant general manager of the Crocker-Wheeler Division, Joshua Hendy Iron Works, Ampere, N. J.

James M. Adams has succeeded **Clayton H. Boice**, retired, sales manager of the Waco, Tex., office of Universal Atlas Cement Co. Adams has been assistant sales manager at Waco since January.

Allen B. Stiles has been named manager of the Philadephia and Baltimore territory for Wm. Powell Co., Cincinnati, Ohio.

Robert H. Gardner has been appointed general manager of sales of A. M. Byers Co., Pittsburgh, Pa. He takes over the duties of the late Myron J. Czarniecki, who died June 18. At the same time, the appointment of **H. R. Rowland** as assistant general manager of sales was announced.

Raymond E. Olson has been made general sales manager of Taylor Instrument Companies, and will head up all of the various sales activities. Succeeding Olson as sales engineering manager is **Ralph E. Clarridge. Frank S. Ward**, formerly assistant industrial sales manager, now becomes industrial sales manager. Assuming additional duties as commercial sales manager is **W. Maben Griffith.**

A. G. KIRKER

W. R. McLAUGHLIN

C. H. PRATT

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Classified Advertising

UNDISPLAYED RATE

8 CENTS A WORD, minimum charge $2 per insertion.
SITUATIONS WANTED, 4 cents a word, minimum charge $1.
BOX NUMBERS, count 9 words when replies are to be sent to our Tulsa Office.
10% DISCOUNT if 3 insertions are ordered at one time, with check accompanying order.
All classified advertising payable in advance.

DISPLAYED—PER INCH

Classified display advertising set in single or double column style:

1 inch	1 time	$7.00
1 inch	13 times	6.50
1 inch	26 times	6.00
1 inch	39 times	5.50
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Rates are governed by total space used within 12 months from date of first insertion. Credits are allowed when lower rates are earned.

FORMS CLOSE 9:00 A.M. MONDAY

Advertising will be accepted in order received, to extent of available space.
Published Each Saturday

RANCHES AND FARM LANDS

RANCHES FOR SALE: Near Walsenburg, Colorado, 1840 acres most level. Some rolling. Bordered on South by Huerfano River. 60 acres irrigated. Free water. Produces 100 ton of alfalfa per year. Fine grazing grass. Lots of good improvements. On paved highway. New high-line and mail route. Included with the land: 147 head of cattle, 9 horses, 13 pieces of farm machinery. ALL for $27,500.

14,000 acres. 7,000 deeded, 7,000 lease to be assigned. 28 miles N. E. of Walsenburg, Colorado. Common improvements. All fenced. Some rough hilly land, pinion and cedar. Good coat of grazing grass, good cattle and sheep ranch. Price of lease 10 cents per acre. Plenty of stock water. Price for deeded land $6.00 per acre.

20 miles N. W. of Walsenburg, Colorado. 4,390 acres on county road. Rolling hilly. Good turf with grazing grass, small house, some pinion, cedar. Artesian well. All fenced. Several springs. Good cattle and sheep ranch. Price $5.00 per acre.

C. O. WALLING
Box 695 Phone 306
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PATENTS, Trade-Marks, Booklet, "General Information Concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 418, Bowen Bldg., Washington 5, D. C.

BUSINESS OPPORTUNITIES

FOR SALE: Oil Refinery; plenty of storage, oil, natural gas and water. Ideal markets; a money maker. Owner wants to retire. $50,000 purchase plant, inventories, pipe lines, trucks, etc. Make inquiries Box A-619, The Oil and Gas Journal, Tulsa, Oklahoma.

ROYALTIES

ANDREW J. BARRETT
The Philtower
Tulsa, Oklahoma

ROYALTIES LOW-PRICED extensive blocks of participating, perpetual minerals, in Florida, Georgia, Alabama, for wholesale brokers, dealers, independents, large buyers. Address: Box 2191, Orlando, Florida.

MAILING LISTS

WOULD cost $150 postage alone to write our 5,000 American financial houses if they bought security issues. My $5 list names the less than 100 who bought $282,000,000 Common Stock last 12 months. JOHN MORRIS, Box 5411, Philadelphia.

EQUIPMENT WANTED

WANTED
2½ INCH PIPE
Also other sizes of pipe and tubes.
Write, wire or phone
SONKEN-GALAMBA CORP.
Kansas City 18, Kansas.

EQUIPMENT FOR SALE

FOR SALE: Two 300 H.P. Sterling-Viking 8 cylinder gas engines, factory serial Nos. TC8-073 and TC8-137, 8″ bore, 9″ stroke, 900 RPM, battery ignition, electric starting. Thoroughly overhauled, rebuilt and carrying 60-day guarantee as to completeness. Call PHILLIPS PETROLEUM COMPANY, Geo. P. Gentry, Bartlesville, Oklahoma.

FOR SALE: One 12,000 and one 15,000 gallon butane tanks. Reasonable. Write for drawings and data. Box A-687, The Oil and Gas Journal, Tulsa, Oklahoma.

1—B. & K. direct connected pipe threading machine 1″ to 4″. Complete set dies. $650.00. One Standard eng. 2½ to 10″. Complete set dies $1,000.00. Machines in tip-top shape. Bender Supply Co., Shreveport, La.

FOR SALE: 2 RXIV Le Roi 8 Cylinder 6¾″x7″ 225 HP. Engines completely overhauled with starting engines with or without twin disc clutches. Jack Gwynn Company, Ltd., Phone 6198, Wichita Falls, Texas.

5½ JOPLIN Special Keystone Spudder, Calf Wheels, Wire line mast, Waukesha Motor, Clutch, Hoist, Tools, Lines, Etc. Charles Anderson, Box 31, Coffeyville, Kansas.

FOR SALE: Well drill machines, cable tools, bits, stems, jars, cable, bailers, blocks, elevators, engines, boilers, fishing tools. Write S. W. Pressey, Pueblo, Colo.

USED BOILER

1—110 H.P. 250# W. P. Broderick
Just Overhauled—New Tubes
New Certificate of Inspection

MOORE & COMPANY
1701 Nat'l Bank of Tulsa Bldg.
Tulsa, Okla. Phone 2-0058

2—60,000 barrel riveted steel tanks with new steel tops and structural steel supports, thickness ¾″ to 5/16″.
1—15,000 barrel welded closed steel tank.
2—10,000 barrel welded closed steel tanks.
1—7,500 barrel welded closed steel tank.
1—5,000 barrel riveted closed steel tank.
1—Parkersburg SC11 pumping unit, stroke 5′ to 11′ in excellent condition. At a bargain price.

JOS. GREENSPON'S SON PIPE CORP.
National Stock Yards, St. Clair County, Illinois

1—Fairbanks Morse 125 KVA, 100 KW, A.C. generator, model R-81 complete with exciter, direct connected to Climax, 4 cylinder vertical gasoline engine Model R-41, 440 volt, 3 phase, 60 cycle, type 2602-A, Unit #1280, Engine #18029 mounted on steel extending sub-base. This entirely portable unit is offered with board and regulator completely rebuilt at $3,000.00 f.o.b. Minneapolis.

1—50 KW Diesel generator, 3 phase, 60 cycle, can be hooked 220, 440, or 2300 volt International UD-18 with General Electric generator, new 1943. Has electric start, complete with switchboard, spare coils for generator, direct connected exciter. Entirely portable, original cost $5,775.00, offered, completely rebuilt at $3,500.00.

PORTER ELECTRIC COMPANY
612 Third Ave. South
Minneapolis 2, Minn. GEneva 8655
Electrical Equipment Coast to Coast

EQUIPMENT FOR SALE

BUBBLE TOWERS, flash towers, pressure standard fittings, Jenkins cracking unit. Shell stills, Condenser box, 2—Cochrane water heaters. OMAR REFINING COMPANY, Garber, Oklahoma.

FOR SALE: Oil Well Power Mud-Hog Pump, 6¾ x 14; Rotary table; Water pump and gas engine 2½ H.P. mounted; scatter shieve Rotary Crown Block. Bargain Prices. Box 106, Seminole, Oklahoma.

FOR SALE: 4 Pressure Vessels—6′ x 20′ Shell made of 1¼″ material—Heads made of 2″ material. Weight 25,000 Lbs. each. In excellent condition. AMERICAN PIPE & SUPPLY CO., 3403 Brighton Blvd., Denver, Colorado.

1—200 H.P. Clark Bros. twin gas engine compressor. Cylinder sizes 18″ and 9′ x 20″. 18—20′ x 40′ x 10′ New sectional steel buildings. C. J. SMITH, 424 Beacon Building, Phone 5-3416, Tulsa 3, Oklahoma.

1—Ingersoll-Rand "IMPERIAL" Type XCB Duplex-Belt Driven Air Compressor, 270 CFM Size 10 x 4¼ x 10, maximum pressure 1,000 lb., complete with Inter-cooler. STEARNS COAL & LUMBER CO., INC., Stearns, Kentucky.

FOR SALE: 6—Used 6″ List 106-A, 800# W. P. Chapman IBBM OS&Y F. E. D. D. Motor Operated Gate Valves with Control Panel, formerly used in electrically operated station. EMPIRE PIPELINE COMPANY, Patridge, Bartlesville, Oklahoma.

FOR SALE: Two Waukesha Drilling engines, 180 H.P. equipped with gasoline starting motors. R. L. Melton, Seminole, Okla.

FOR SALE

150—8,000 Gal. R.R. Tank Cars
10—10,000 Gal. R.R. Tank Cars.
30—6,000—8,000—10,000 Car Tank Shells
8—15,000 & 20,000 Gal. Tanks
1—175-Gal. Jones Oil Heater
2—20 H.P. Charlotte Colloid Mills

R. C. STANHOPE, INC.
60 East 42nd St. New York, 17, N.Y.

TANK CAR

One 8,000 gallon oil tank car. Good condition. Priced right.

SONKEN-GALAMBA Corp.
Kansas City 18, Kans.

FOR SALE

2 Bessemer gas engines

Number	Bore	Stroke	R.P.M.	H.P.
16429	16″	18″	200	165
16430	13½″	18″	180	50

HAWS REFRACTORIES COMPANY
P. O. Box 350
JOHNSTOWN, PENNSYLVANIA

RELAYING RAILS

12#—exceptionally good quality
36″ gauge, 25# portable Tracks
RAILROAD TIE PLATES
for all size rails. All in good condition.
For complete details, contact

SONKEN-GALAMBA CORP.
Kansas City 18, Kans.

FOR SALE: STEAM ROTARY RIG

7500 feet 4½ inch Drill Pipe.
2—125-250 Oil Well Boilers.
1—105-250 Oil Well Boiler.
1—8″ Union Tool Drawworks with New 36″ Parkersburg Hydromatic Brake.
1—27″ Ideal Rotary.
1—7¼″ x 18 Wilson Snyder Mud Hog Pump with side suction.
1—7¼ by 14 Gardner-Denver Mud Hog Pump.
1—66″ Ideal RB Traveling Block with 8″ Hook.
1—5 sheave Oil Well Crown Block with cat line sheave.
1—12″ x 12″ Ideal-Ajax Engine.
2—10 x 4½ x 10 Worthington Boiler Feed Pump—Complete Unit.

The above Rig is complete and ready to drill—recently completed 7500 foot contract in East Texas where Rig is located. Priced to sell.

JOE SHULMAN
Box 1906, Longview, Texas